406823

THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXX. No. 11. Whole No. 1,240. | NEW YORK, MONDAY, MARCH 13, 1899. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—

Fifteenth Annual Meeting, Ohio Gas Light Association..... 365

First Annual Meeting, The Kansas Gas, Water and Electric Light Association 365

Wrinkle Department, Western Gas Association 365

EDITORIALS—

Briefly Told 365

Steam in Gas Works Operations—Notes.

Proceedings, Twenty-ninth Annual Meeting, New England Association of Gas Engineers—Official Report—Revised by the Secretary—Concluded from page 336 366

First Day, Feb. 16—Afternoon Session—Steam, by Mr. W. E. McKay—Discussion—Second Day, Feb. 17, Morning Session—The Question of Enrichers, by Mr. E. H. Yorke—Discussion—Possibilities, by Mr. J. A. Waters—Discussion—Tar Burnnig, by Mr. F. C. Sherman—Question Box—A Beginner's Experiments in Studying the Operation of a Lowe Water Gas Apparatus, by Mr. J. B. Polk—Discussion—Votes of Thanks—Adjourned.

Abstract of Proceedings, Sixth Annual Meeting, Michigan Gas Association. 374

First Day—Feb. 22—Morning Session—Roll Call—Report of Executive Committee—Election of New Members—Report of Secretary and Treasurer—Report of the Special Committee on Coal Tar—President's Address—The Importance of Proper Boiler Settings in Water Gas Plants, by Mr. John R. Lynn—Some Telegrams—First Day, Afternoon Session—A Desirable Increase and Its Source, by Mr. S. E. Wolff—The Question Box.

Some Notes on the Preserving and Fireproofing of Timber and Timber Substitutes, by Mr. S. C. Coles..... 377

Gas—The Hated Rival..... 378

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 379

The Federal Gas and Fuel Company—Annual Meeting, Nashville, Tenn.—Sale of the Columbus (Miss.) Plant—Mr. Fennessy Goes to Stroudsburg, Pa.—A Hint from Perth Amboy, N.J.—Annual Meeting, New Amsterdam Company—The Hartford (Conn.) Company's Petition Allowed—Mr. E. Flanigan Takes Charge at Pittston, Pa.—Change in Ownership, Equitable Gas and Electric Company, Utica, N. Y.—Gas and Electric Interests Combined, Healdsburg, Cal.—Public Lighting, Brooklyn, N. Y.—The Jenkintown (Pa.) Plant Opened—An Interesting Law Point—Remembering Mr. J. A. P. Crisfield—The Bill for the Promotion of the Astoria Light, Heat and Power Company—The Suburban Gas Company, Westchester County, N. Y.—And Other Items.

The Market for Gas Securities..... 380

[OFFICIAL NOTICE.]

Fifteenth Annual Meeting, Ohio Gas Light Association.

OFFICE OF THE SECRETARY, DELAWARE, O., Feb. 16, 1899.

To the Members of the Ohio Gas Light Association: The 15th annual meeting of the Ohio Gas Light Association will be held at Springfield, O., March 15 and 16, 1899.

Owing to the death of our President, the late Mr. B. P. Holmes, of Youngstown, O., the meeting will be called to order by the Vice-President—Mr. E. H. Jenkins, of Buffalo, N. Y.—at 10 A.M., Wednesday, March 15, in the Arcade Hotel, the headquarters. An address of welcome will be delivered by the Governor of Ohio, General Asa S. Bushnell, President of the Springfield Gas Company. The following papers are promised:

"Distribution Records: Their Uses and Preservation," by Mr. J. A. Mayer, Supt. of Streets, Detroit (Mich.) City Gas Company.

"Welsbach Street Lighting," by Mr. J. W. R. Cline, Secretary and Manager, Springfield (O.) Gas Company.

"A Bunch of Short Topics," by Mr. Henry L. Doherty, General Manager, Madison (Wis.) Gas and Electric Company.

"Some Notes on the Construction of a Concrete Gasholder Tank," by Mr. C. W. Andrews, President Hamilton (O.) Gas Light and Coke Company.

"By-Product Coke Ovens," by Mr. E. E. Eysenbach, Supt. of Works, Columbus (O.) Gas Company.

The executive session will be unusually interesting, and some "Notes" on a subject of vital importance to the profession will be presented. The Question Box will be given special consideration, and each member is requested to make contributions for it.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Springfield; but not after, as all the reports will be turned over to the printers immediately after the adjournment of the meeting.

The management of the Arcade have named the following very low rates for the meeting: $2, $2.50, and $3 per day, American plan. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

Application blanks for membership, and any further information which may be desired relative to the meeting, will be furnished with pleasure by the Secretary. T. C. JONES, Secretary.

[OFFICIAL NOTICE.]

First Annual Meeting, The Kansas Gas, Water and Electric Light Association.

OFFICE OF THE SECRETARY, LEAVENWORTH, KAS., Feb. 18, 1899.

To the Members of the Kansas Gas, Water and Electric Light Association: The Executive Committee of the Association have decided to postpone the first annual meeting (originally named to have been held in Topeka, Kas., the 15th and 16th inst.) to the 15th and 16th days of March; the sessions to be held in Topeka. The postponement was ordered because of the expressed inability of many of the members to be present at the initial time set, through the prevalence in this section of extraordinary low weather temperatures.

Yours truly, J H. FOLEY, Secretary.

[OFFICIAL NOTICE.]

Wrinkle Department, Western Gas Association.

WESTERN GAS ASSOCIATION, OFFICE OF THE SECRETARY, NEW ALBANY, IND., Jan. 16, 1899.

To the Members of the Western Gas Association:

Mr. E. H. Jenkins, Editor of the Wrinkle Department, desires it known that those who have contributions to offer for publication in this valuable division of the Association's proceedings, should forward the same at as early a date as possible. All matter should be in hand not later than April 1st. Let no member fail to Mr. Jenkins a description of any device that saves labor or insures through its use better service in the production or distribution of gas.

Address all communications to Mr. E. H. Jenkins, Engineer Buffalo City Gas Company, Buffalo, N. Y. J. W. DUNBAR, Secretary.

BRIEFLY TOLD.

STEAM IN GAS WORKS OPERATIONS.—In this number of the JOURNAL we conclude our report of the proceedings of the 29th annual meeting of the New England Association of Gas Engineers, and those who have followed carefully the recital of that which was said there will undoubtedly agree over the verdict that the oldest Association well holds its place as an important and aggressive member of the many bodies

whose purposes and activities are like unto its own. The papers submitted were of a practical type, in that their lines were devoted to subjects easily within the experience of the everyday gas superintendent, and the discussions on the topics presented showed that the members who listened were not less interested than were the members who wrote. One of the set numbers (the paper[1] on "Steam," by Mr. W. E. McKay, of Boston), is particularly interesting, since its author, in his usual clear and incisive way, and without any wasting of words, called attention to what may and does occur through the misuse and use of steam in and about a gas works. Much of the meat in the McKay narrative is to be found in his second paragraph; and we imagine that his assertion that "* * * The summary shows an average installation of 1.06-horse power of boilers per 1,000,000 cubic feet of annual output. As 1-horse power represents about 15 tons of fuel per annum, this installation denotes more outlay for steam than for purification," and the disparity, as between the outlay for steam account and for purification account, would seem to be greater as the output increases—in water gas plants especially. We believe it may not be successfully gainsaid that the steam room practice in the majority of American gas works could be revised with profit to the proprietors and with satisfaction to the engineers, did the former accede to the demands of the latter. In fact, that it could be done in one place at least we know, for the President of the Company, when informed by the Superintendent that an additional boiler was necessary, asked the "Super." if the lengthening of the tubes in the vessel now in use would not bridge him over! However, the main point is that the steam apparatus is worthy of close attention, and we are quite sure that Mr. McKay's sensible lines will arouse thought leading to better results in many a gas works' steaming outfit. Another paper,[2] with like starting point and of similar thought, was read by Mr. John R. Lynn, of Benton Harbor, Mich., at the last meeting of the Michigan Gas Association. His presentation of the matter of "The Importance of Proper Boiler Settings in Water Gas Plants" is a fit companion for the McKay argument, and in the many useful suggestions for steam practice made by Mr. Lynn, he submits a proposition perhaps not strictly akin to the subject—that the insuring of boilers will pay well in the long run. To this we heartily assent, and we would even go further on that account, by suggesting that insurance would be a good thing for the gas companies, in respect of every branch of their plant. The papers are both of the useful type, and the authors thereof are to be congratulated on their frankness.

NOTES.—Senator Lyons has introduced a bill in the Missouri Legislature, providing for the appointment by the Governor of inspectors of gas and electric meters in all cities of the State having over 50,000 inhabitants. The salaries and fees of such inspectors are limited to $3,000 per annum. Missouri has three cities of the size stipulated—St. Louis, Kansas City and St. Joseph; and if we mistake not the one of these not now burdened with a gas and meter inspector is St. Joseph. ——The Citizens Gas Light Company, of Willimantic, Conn., and the Willimantic Electric Light Company, have been purchased by a syndicate headed by Judge Luther Hill, of Spencer, Mass. The officers selected to manage the affairs of the new interest are: President, Luther Hill; Secretary and General Manager, E. S. Evans.——The petition of the proprietors of the Waltham (Mass.) Gas Light Company, to the Board of Gas and Electric Light Commissioners, for the right to issue $70,000 of additional capital, was considered last Thursday. The Board reserved its decision.——The Trustees of the municipal gas plant in Wakefield, Mass., are considering whether or not it would be advisable to reduce the selling rate in the sum of 10 cents per 1,000 cubic feet.——Some time ago arbitrators were appointed by the city of Louisville, Ky., to examine the accounts of the Louisville Gas Company, with a view to determining whether the Company's earnings were of a nature sufficient to order a reduction in the gas rate. Under the Company's charter it is prescribed that if its earnings are in excess of the amount required to pay a dividend of 8 per cent. per annum on its stock, the city may, through arbitrators properly appointed, put the gas rate at a price that will yield no higher return than 8 per cent. These examinations are to be made at intervals of three years. Last year the arbitrators made their examination (the payment of the arbitrators is a joint charge on the city and the Company), reported their findings and submitted their bill—it amounted to $3,600. The Company paid its half forthwith; the city has just settled its half. Between the two payments there was a lapse of several months. The real color in the woodpile is that the city thought the bill was too high. The investigation showed that the Company under the existing rates was earning something in excess of 6 per cent.

1, See page 366. 2. See page 374.

[OFFICIAL REPORT—REVISED BY THE SECRETARY.—Concluded from Page 336.]

PROCEEDINGS, TWENTY-NINTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD IN YOUNG'S HOTEL, BOSTON, MASS., FEB. 16 AND 17, 1899.

FIRST DAY—FEB. 16—AFTERNOON SESSION.

Mr. W. E. McKay (Boston) read the following paper on

STEAM.

The study of heat is an essential preliminary to an advance in the economy of gas manufacture. Gas engineering deals with the effects of heat, and with its generation, conservation, distribution and dissipation. It is almost possible to say that the engineer who knows heat is "the man who knows it all."

One item of the heat industry that may profitably engage the attention of gas engineers is steam, for it is our invaluable assistant. Doubtless at many plants the cost of purification receives more consideration than the cost of steam, yet, on the average, the total annual outlay for steam must be by far the greater. From the "American Gazetteer of Power Plants" (1896), and from the report of the Board of Gas and Electric Light Commissioners, of Massachusetts (1897), I have taken the data given in the table. The summary shows an average installation of 1.06-horse power of boilers per 1,000,000 cubic feet of annual output. As 1-horse power represents about 15 tons of fuel per annum, this installation denotes more outlay for steam than for purification. If this is so, the generation and use of steam are worth study, and such study will often be more immediately profitable than incessant experiment with the purifiers.

It has been observed that a group of mechanical engineers engaged in friendly talk can be separated into wrangling factions by the mention of a particular steam generator; for there are zealous advocates of every boiler built. It is not my purpose to set forth a proper system for generating, distributing and using steam; but I wish to direct your notice to this detail of our business, with the statement that its careful supervision frequently contains the possibility of a considerable saving.

As illustrative of extreme variation in design, note two of the largest and most modern boiler plants in Boston. The Edison electric light station on Atlantic avenue has down-draft furnaces, Babcock & Wilcox boilers, and an enormous and lofty brick stack; while at the new South Union depot the boilers are horizontal, fire-tubular, with mechanical stokers, and a fan is used to reduce draft, so that the chimney is so short as to look like a small tank set on the roof of the building. Such disagreement among experts may well cause others to hesitate in deciding.

Again, the new pumping engine at Chestnut Hill station, Boston (1895), of 575-horse power, has triple expansion, condensing engines, 185 pounds pressure, and used 1¼ pounds coal and 11¼ pounds steam per horse power per hour. Yet the Oakley avenue power house of the Chicago City Railway (1897), with 24,000-horse power, has simple, non-condensing engines, 100 pounds pressure, and uses about 4 pounds coal and 30 pounds steam per horse power per hour.

Of all the factors concerned in the cheap generation of steam the most important is the fireman. Good coal, pure water, efficient heater, forced draft, and the best grates under the best boiler can all fail to give an evaporation of even a gallon of water per pound of fuel, unless the fireman has both sense and experience. It may fairly be stated that the most intelligent firing will be worth 1½ times as much as the least skilled labor—not 1½ times the wage paid; but good firing will use only three-quarters the fuel that will be needed by the inferior workman. In one case which came to my knowledge, where the load was constant, twelve 200 horse power boilers were in use with unskilled firemen. A new engineer revised the practice and reformed the fire room, and eight of the boilers performed the service. This change reduced the coal expenditure by 15 tons per day, and the number of firemen was lessened.

Two large plants using similar coals had different records of the ash; rivalry was stimulated, and the plant, which had at first been content with 8 per cent. ash, ended by being dissatisfied with only 4 per cent. Small plants cannot afford expensive tests, but some way of measuring the coal burned, the ashes removed, and the water evaporated is within the means of nearly all; and, even if results are only comparative, the trial is remunerative.

Pipe dry steam to every point in a gas works, or arrange to tap the main supply by use of hoses. When any part of the gas apparatus has been opened, steam is the agent that will quickly expel from the vessel

any dilatory gas. A station meter or a scrubber can thus quickly be put in such condition that workmen can enter it. If the air is, by steam, expelled from the purifier, there will be less loss of candle power when boxes are changed.

Efficient pre-heating of naphtha and other enrichers has been performed by steam jacketing coils of pipe containing the oils, and also by surrounding steam pipes with the oils and oil vapors. Gas oil thus heated is useful in thawing ice in oil tank cars, or in exposed mains.

In a water gas generator there is the most tempting field for experiment, as to the quantity of steam to be used and as to the best manner of introducing it into the apparatus.

Steam has long been used in scurfing retorts, and Mr. Gifford has informed us how superheated steam for this purpose has been found effi cient.

Where the exigency ignores the expense, the steam siphon is a convenient pump for lifting or forcing liquids and gases.

If tar or oil is to be used as fuel under benches or boilers, steam with the oil spray is in common use. (A steam oil injector or pulverizer is in universal use on the railways and steamships of Southern Russia.)

The bugaboo naphthaline yields to steam; 10 tons of naphthaline have been expelled from a few condensers and connecting mains by keeping .1 pound steam pressure on the gas vessels during 10 hours. Or the naphthaline may be removed by introducing steam heated naphtha into the main. The hot naphtha dissolves the naphthaline so that both can be pumped out.

Steam turned into the top of an oil tank may extinguish the fire. (I have never seen this result accomplished, and I hope not to need to make the trial.)

Properly constructed steam coils effect a complete separation of water gas tar, and if the heating is prolonged the tar will furnish fine pitch.

Mr. Learned can tell how purification may be improved by steam heating the iron sponge. In fact, Mr. Learned so thoroughly subscribes to the omnipotence of steam that he has it wheeled about the streets of Newton—an important auxiliary in winter in the successful search for leaks.

High pressure (for heavy loads) gives cheaper service, but in construction the factor of safety should not be reduced in the attainment of this economy. Lower pressures make much easier the work of keeping the mains and joints tight, and there is usually less damage from a break. But whatever the pressure, the distributing system should be kept tight, for every leak of steam is coal and water run to waste. The Oregon had no steam leaks when she engaged the Spanish fleet. It was due to this, and to the skillful firing of good coal under all boilers, that she made that magnificent burst of speed which astounded the navies of the world—already perturbed by her splendid run from San Francisco to Key West.

The three dimensions of President Fowler's long, wide and deep experience with steam will give you a fair measure of this topic, which he asked me to introduce that he might take a broad view of the subject and expound to you a new phase of expansion.

Power Used in Thirty Massachusetts Gas Works.

Annual Output in Millions	Gas Company.	Horse Power.			Boilers.	Engines	Pumps.	Dynamos.
		Total.	Electric	Gas.				
1,130	Boston	1,500	.....	1,500	15	22	20	.....
158	Dorchester	85	.....	85	2	2	3	.....
220	Roxbury	85	.....	85	2	2	3	.....
106	South Boston	85	.....	85	2	2	3	.....
1,071	Bay State	1,125	.....	1,125	9	5	14	.....
30	Brockton	10	.....	10	2	2	2	.....
55	East Boston	15	.....	15	1	2	1	.....
200	Cambridge	90	.....	90	2	2	5	.....
35	Chelsea	615	600	15	3	7	6	11
9	Clinton	375	275	100	2	2	1	5
12	Chicopee	11	.....	11	1	2	2	.....
21	Fitchburg	450	450	.....	4	2	1	9
81	Haverhill	60	.....	60	2	3	2	.....
69	Holyoke	52	.....	52	2	3	1	.....
89	Lawrence	600	600	.....	4	6	2	10
315	Lowell	250	.....	250	4	6	5	.....
137	Lynn	1,100	800	300	8	5	6	19
69	Malden	20	.....	20	2	3	1	.....
8	Marlborough	10	.....	10	1	2	2	.....
14	Milford	6	.....	6	1	1	1	.....
4	Natick	10	.. ..	10	1	1	.....	.....
58	New Bedford	85	.....	85	1	3	4	.....
10	Newburyport	250	250	.....	2	3	2	7
86	Newton	1,100	1,000	100	4	4	2	8
26	North Adams	450	300	150	2	3	1	10
19	Northampton	35	.....	35	1	1	1	.....
110	Springfield	100	.....	100	13	9	8	.....
10	Westfield	10	.....	10	1	1	2	.....
11	Woburn	3	.....	3	1	1	1	.....
204	Worcester	320	.....	320	2	4	8	.....
4,367		8,907	4,275	4,632	97	111	110	79

Discussion.

The President—Attention it seems to me should be somewhat diverted from the President. This paper on steam is one which Mr. McKay had, as I supposed, promised me a year ago yesterday, by the day of the week, when we separated from last year's meeting. I knew that any paper Mr. McKay wrote would be of particular interest to us, and especially so this year, after his attention had been closely called to the steam business from his experience during the summer as a naval officer. The time to which our sessions usually extend has now passed, but I know all will be extremely interested should Mr. McKay relate some of the experience which he gained on board a United States boat in its steam division.

Mr. McKay—I suppose the President refers to what interested me very much—the use of steam under 225 pounds pressure. On board the vessel of which I had command there was no engineer officer; instead there was a chief machinist, who had had little experience with marine engines. Of the three junior line officers not one had any practical knowledge of a boiler or an engine; so I had to assume a general supervision of the steam department. We had several accidents in our first trials of the ship's engines and boilers; not with the engines and boilers themselves, but with the piping and the joints. It is extremely difficult to keep mains tight under that tremendous pressure, especially with the vibration of the boat. On one occasion, when we had steam at a little over 225 pounds pressure, a gasket on a 6-inch flange was burned out. Five men were in the fireroom and it seemed less than three or four seconds before they were all up. The last ones up, however, were almost prostrated in that exceedingly short time, although the fireroom was well ventilated and entirely open. Steam at 225 pounds pressure is a most virulent gas. There is nothing about it that you can see and the heat is overwhelming. After that first experience we had additional doors cut through the bulkheads of the vessel. On a second trial another large gasket flew out. The steam blew open the door that we had had cut in the iron bulkhead, and carried a man through it. He started right forward and got up to another hatch. But I suppose it was the difficulty I found in keeping those joints tight that particularly impressed me with the excellent work that was done on the Oregon, in not having a single steam leak in all its great system of piping, and also with the advantages—that we are inclined to neglect or to underrate—that go with a more moderate pressure. While we do get greater efficiency in a scientific way from these high pressures, the danger from the use of the high pressure steam is certainly also greater. The damage from an accident is apt to be very largely increased, and the difficulty of keeping everything tight is evident.

The President—Gentlemen, I know you all thank me for having drawn that little story out of Mr. McKay. The importance of steam around gas works also seems to me not often realized. In gas works the fires are generally kept in the boilers with refuse and breeze; that is, breeze not salable is put under the boilers. The calculation that I made, being on rather a different basis, having no boilers in our gas plant and the steam plant insuring to the gas department a good sale for all the refuse, showed that the total worth of the steam in our gas works came very close to being 3 cents a thousand. That included, of course, all interest and maintenance charges, which the gas department does not have to carry at all.

On motion of Mr. Slater, a vote of thanks was passed to Mr. McKay. On motion of Mr. Lamson, the sessions were declared adjourned to 9:30 A.M., Feb. 17.

SECOND DAY, FEB. 17, MORNING SESSION.

The President opened the proceedings of the morning of the second day by reading the following "Short Topic," on

THE QUESTION OF ENRICHERS,

contributed by Mr. E. H. Yorke, of Portland, Me.:

The demands for a high illuminating power gas are imperative and appear to increase in force with each succeeding year. The day when the gas consumer would be satisfied with either an 18-candle coal gas, or a 24-candle water gas is past and gone, and unless he receives a gas of at least three candles better than these, he is not satisfied. The gas manager, too, I think, recognizes that he will best

promote his company's interest by distributing a high candle power gas. The question, then, of enricher becomes an important one, especially if he is confronted with a rising market for the required material. As his selection of an enricher is limited (if he is making all water gas) to petroleum in its various forms, or to oil and cannel coal, if he is making all coal gas, or a mixed gas, he has the interesting problem before him as to which of these enrichers will bring the illuminating power of his gas up to the required standard at the lowest cost.

In order to determine this let us for a moment consider the facts regarding the different enrichers, to wit: Assuming that a net ton of cannel coal produces 10,000 cubic feet of 40-candle gas; this would be 400,000-candle feet. Assuming that this cannel coal costs $8 per ton, the cost for enrichment with this material will be, per 1,000-candle feet, exactly 2 cents.

If 75° naphtha is used, at a cost of say $5.50 per gallon, and assuming that a gallon will produce 80 cubic feet of 60-candle gas, this would give a total of 4,800-candle feet, or a cost per 1,000-candle feet of 1.14.

If gas oil of about 45° is used, at a cost of say $4.25 per gallon, and it produces 90 cubic feet of 50-candle gas, this would give a total of 4,500-candle feet, or a cost per 1,000-candle feet of .94 cent.

My impression is that good crude oil would yield about the same number of candle feet as gas oil, hence the cost for enrichment with crude oil would be proportional to its cost as compared with gas oil.

In submitting these figures the writer begs to state that the yield, candle power and price are not presented ex-cathedra, but only as a basis for determining the relative values of the different enrichers. If the foregoing figures are approximately correct a few deductions will be interesting. Taking naphtha at $5.50 per gallon as a base, the cannel coal would have to be purchased (in order to be as cheap as naphtha) at $4.58 per net ton; and naphtha, to be as cheap as gas oil, at approximately the same price as gas oil.

Discussion.

The President—I believe most managers will agree that Mr. Yorke's statements coincide with their own experience. Some years ago, when investigating the question whether to enrich with cannel or with oil, I found that enriching with oil cost only about one-half as much as enriching by cannel.

On motion of Mr. Sherman, a vote of thanks was awarded to Mr. Yorke.

The President read the following "Short Topic," by Mr. John A. Waters, of Stamford, Conn., entitled

POSSIBILITIES.

Gentlemen: "Possibly" an apology for this "Short Topic" (?) is necessary; therefore, fellow-members, I will state that it was prepared with the desire and hope of its author to provoke an old-time discussion on the practical or everyday manufacture of gas, such as the meetings of the New England Association of Gas Engineers were noted for less than a decade ago. At those meetings a good-natured rivalry was apparent throughout the discussion, and although some members withdrew from the wordy war with colors lowered, the laurels were gathered in by the victor, and the results of the conflict were mutual and beneficial to all. To that end, and again expressing the hope for an animated discussion, I herewith present a few "Possibilities."

One of the many possibilities of our business is the continual reduction of cost of manufacture. Changes in operative methods of producing water gas have made it possible to reduce very materially the coal and oil items. A very few years ago the possibility of making a 22-candle gas with less than 50 pounds of coal and 4.75 gallons of oil per 1,000 was considered very remote. To-day we are obtaining much better results, particularly so in regard to coal.

Formerly it was thought all-important in heating up water gas apparatus to maintain a blast pressure of 15 inches (water) during blow. Now, up-to-date gas men recommend a reduction of fully one-half; or, to be more explicit, a blast pressure of 6 or 7½ inches. Results obtained probably justify this radical change. However, the subject is worthy of our very careful consideration, and suggests an important possibility in coal economy.

Temperatures of carbureter and superheating chambers have also met with quite a reversal during recent years. Time was when gas engineers thought it imperative in the making of a fixed gas to have highest temperature at top of superheater. Modern methods change all this. Eminent engineers now advise the carrying of highest temperature at top of carbureter, with a gradual reduction towards top of superheater. Better results in oil are claimed. This presents another possibility which merits the consideration of our members.

The practice of cooling gas to 60° or 70° at condenser outlet is also alleged to be wrong. Possibly this is due to the advent of the relief holder. Be that as it may, we have engineers among us to-day who believe naphthaline and various other troubles would follow should they allow their gas to pass condenser at a higher temperature than 70°. On the other hand, many engineers claim that the proper temperature at condenser outlet should be 105°, based on the theory that a lower temperature would throw down valuable illuminants. Each procedure has its adherents, but the possibility remains of one system being wrong.

There is a vague possibility that candle power to-day is not tested with that same unanimity in regard to orifice of tip that characterized the practice of a few years ago. A very respectable portion of the gas consumers in New England use but 4 or 5-foot tips in burning our product. Such being the case, is it not possible that we could retain our consumers' friendship by enlightening them with gas shown by photometer as 22-candle, under a test with a 5-foot orifice in tip? We could reserve the results obtained by using an 8 foot orifice for the information of our brethren in the business who boast of a higher candle power. There is quite a diversity of opinion in regard to this subject, and possibly the New England Association will take the initiative and adopt a standard orifice or slit for flat flame candle power testing.

The growing demand for incandescent burners has suggested to the average gas manager the fallacy of making a high candle power gas, when, as it is asserted, practically the same illuminating value can be obtained from gas of a much lower candle power, with an incandescent burner. If this is so, is there not a future possibility for non-luminous or blue gas.

In order to bring this paper within the scope of "Short Topics," I will close with a word to our coal gas brethren. Why they are complacently waiting for a charge of coal to "fry out," does it occur to them that they are but following the practice of a century ago? Slowly the gas is emitted from that mass of coal in the retort, and slowly, very slowly, the holder responds; and so it has been since the days of Murdoch. Very few improvements have been made in bench or retort tending to reduce the period of distillation. The D-shaped retort is still the standard, and the coal receives the radiant heat of its walls as of yore. Among the future possibilities of our business the rapid distillation of coal is certainly deserving of more attention than it has received.

In conclusion, gentlemen of the New England Association, the gas business possesses innumerable possibilities. A few are here presented; many will occur to us; many will remain dormant, unless the engineers take advantage. Future economy in gas production depends very largely on "Possibilities."

Discussion.

The President—An interesting point made by Mr. Waters is in his remark, that "formerly it was thought all important in heating up water gas apparatus to maintain a blast pressure of 15 inches water during blow. Now up-to-date gas men recommend a reduction of fully one half; or, to be more explicit, a blast pressure of 6 or 7 inches. Results obtained probably justify this radical change."

Mr. J. J. Humphreys—Mr. President—I do not know whether the gentleman who wrote that paper spoke exactly from his own experience or from the paper[1] written by Mr. J. M. Rusby, for the last meeting of the American Gas Light Association, in which the latter spoke of a head of air on the generator of about 5 to 7 inches, which is entirely different, of course. That would be the difference between the pressure on the carbureter and the pressure under the fire. Seven inches head on the fire is an entirely different thing, of course, from 7 inches blast pressure. The Sturtevant blower people, who claim to know what is going on in the high pressure business, say they are making blowers for higher pressures than they heretofore have done, particularly for water gas.

Mr. Coffin—I differ from what Mr. Waters said respecting lack of improvement in coal gas manufacture. I have been a member of this Association fewer than 20 years, but I distinctly remember we have improved coal benches very nearly 50 per cent. in that time. I remember when 6,000 or 7,000 cubic feet per mouthpiece was considered a fairly good average yield, whereas to day the yield approaches 12,000, on a consumption of about two-thirds the fuel. In my opinion there has been a decided improvement along the lines of coal gas manufacture.

1. See JOURNAL, Nov. 7, 1898, p. 675.

Mr. Gifford—I think Mr. Addicks favors high blast pressure.

Mr. Addicks—In the first place, in any of this apparatus we have pressure due to resistance of the pipes and blower. If we throw that out there will be a reduction in pressure below 15 or 16. The next point to consider is the increased pressure due to small pipes and running a large make at the generator. I don't see any particular advantage in very high blast pressure, but I think our blast pressure is higher than formerly because the outlet pipes, the stack valve or the connection originally having been designed, say, for 450,000 to 500,000 feet, when we now make upwards of a million feet in those same settings, must certainly influence the blast pressure as well as the gas pressure while making gas, and naturally we must use a much larger quantity of coal on the same grate area and the same depth of fire. I think the reduction in the amount of coal used per 1,000 may be due to the larger quantity of gas made on that same area and the same volume of fuel. I am not prepared at the moment to say the exact pressure that would seem to be the most economical. I think that physical conditions govern it greatly. I don't see why an abnormally high pressure is of any value. On the contrary, I should think it would tend to be wasteful rather than economical. It is merely a question of the grate area and the resistance of the air to the fuel, based upon a certain make.

Mr. Morrison—With a given apparatus, the make of gas per hour depends entirely upon the quantity of air you get through your fire Theoretically there is a certain amount; practically I believe it takes from 2½ to 3 times as much air per minute as you make gas per minute—that is, of the finished gas. It depends entirely upon what you want. By increasing the quantity of air you get through, or by increasing the pressure under the fire, you increase the make of your set, and there the whole question hinges. Another point to be remembered is that in the later designs of apparatus most all the branches between the shells are large, so that with a much less pressure you get the same or an equal volume of air through your fire.

Mr. Prichard—I am not so sure there is not something in what the gentleman says, and I am not so sure but that we have got beyond the proper blast pressure even at the present time. This thing comes right home to me, for within the last few months I have been having a great deal of trouble with the set stopping up. It has occurred to me whether it was not on account of too high a blast pressure and that we were carrying the ash over into the carbureter and superheater. The practical result of it is that, although with this high blast pressure we make extremely short blasts and make a great amount of gas, yet at the end of three or four weeks our set has gotten into such foul condition that we cannot make nearly as much gas as we ought to, and we have to let the set down and clean it. The set I first put in had to be cleaned in less than 30 days, and it seemed to be solid full of ash. It is a question in my mind if the blast pressure, which was carried at 20 inches, was not too high, and if with 8 or 9, or even 6 inches, as Mr. Waters said, I might not have had a considerably better average economy, coke, oil, labor and cleaning considered, although not getting such good results at first.

Mr. Wood—I would like, Mr. Prichard, to ask if this 20-inch blast is the initial pressure at the blower or at the blast connection of the generator when blowing up.

Mr. Prichard—At the blast connection, with the blast on.

Mr. Wood—That is higher than any other pressure I ever heard of. I don't wonder there is ash in the superheater.

The President—What is the difference between the pressure at the bottom of the generator and at the top of the carbureter.

Mr. Prichard—Three inches difference of pressure between the top and bottom of the generator.

Mr. Addicks—There is another influence for economy in having a low pressure outside of the generator entirely. I think that, running these practically as he has, 20 inches would affect it somewhat; that is, the blower that is in use. I have followed Mr. Flannery's lead in using a pressure blower, and I have had no reason to change that practice. If the fires were dirty, or if a large quantity is made on a small set, it seems to me it is essential to have a pressure blower. I think the Sturtevant people would acknowledge that high pressures are not good for their blowers, as made at present at least; that they not only take more power proportionally, but that also they are not made as a rule for such higher pressure, and the wear and tear of the blower is serious. From that point of view alone, outside of the generator, it is desirable to have a low pressure or a high pressure blower. I don't think that is of very great moment one way or the other. I think Mr. Wood is carrying about 7 inches pressure. That is in the Wilkinson sets—the sized pipe and the make and everything being considered—7 inches is the pressure necessary on the set to make the greatest amount of gas, and it is merely a question of the cost per thousand in making that gas. In the matter of the U. G. I. Company's setting the mere taking apart of the machine, after making a great many millions, I think you will find is a very low figure—I refer now to cleaning the carbureter and superheater, not to cleaning the generator.

Mr. Prichard—But the question of total pressure on a double superheater set of 20 inches is a different matter from the question of a difference of 7 inches pressure between the top and bottom of the generator, which I understand to be your condition.

Mr. Addicks—Yes; that is the total difference between them.

Mr. Prichard—Well, the generator is all there is in the Wilkinson set, under blast; isn't it?

Mr. Addicks—Yes; I suppose that would be true, if it were only a difference of 3 inches in the generator. Yes; practically it is double what you are carrying. Yes; that is so—I did not think of that, although 7 inches seems to be a low pressure; but with the Wilkinson it seems a high pressure. Not a high pressure for coal but would seem high if coke were used, based on the given difference in pressure as stated by Mr. Prichard for U. G. I. settings. The depth of coal in each case must first be stated, however.

Mr. Morrison—Mr. Prichard's loss of pressure (3 inches) in fires is certainly low.

The President—That may be perhaps due to the fuel. I understand you use coke exclusively, Mr. Prichard.

Mr. Prichard—Yes.

Mr. Morrison—The loss should be very much more with a 20-inch blast; but, of course, the size of the connections, the condition of the checkerbrick and the size of the stack valve are factors in determining the head. With a blast of from 10 to 13 inches I only clean the checkerbrick once a year.

Mr. Prichard—How many million do you make, Mr. Morrison?

Mr. Morrison—About 30,000,000 from one cleaning of the superheater brick; the carbureter brick we change twice a year. There is not such a great accumulation, we have to carry such a high pressure under the fire to get the air through.

Mr. Addicks—If Mr. Prichard used hard coal instead of coke, does he not think he would have to get a greater pressure from the top and bottom.

Mr. Prichard—Yes.

Mr. Addicks—I also want to ask him whether it would not be a fact that, using coke, he would be more apt to carry over more dust and dirt to stop his carbureter than when using coal.

Mr. Prichard—I understand that is so.

Mr. Shelton—I agree with Mr. Addicks entirely that the difference of fuel makes a difference in the result. One needs to clean more often when using coke. I think moreover that the question of frequency of cleaning in the superheater is very largely a matter of individual management. One of the best men I have ever known in running his gas plant cleans the superheater every six weeks whether he needs to or not, so to speak, and he has some of the lowest costs and best results in the business. Some say it is perfectly unnecessary; that once a year is sufficient, or once in six months; and so you will find all ranges of ideas. It is a question of condition, of fuel, of form of apparatus; in short, of every factor that goes to make up a situation, and one cannot lay down any set rule as to how often to clean. I think on the blast question that the general tendency to-day is to get large volume of air (by means of large openings) at a moderate pressure, getting volume, but not under forced tension or too high pressure.

On motion of Mr. Shelton, a vote of thanks was passed to Mr. Waters, after which the President called upon Mr. F. C. Sherman (New Haven, Conn.), to read a promised "Short Topic" on

TAR BURNING,

which brought out the following speech:

Mr. Sherman—This (exhibiting a plan) is a diagram of new steel coal sheds erected by us last season. Regarding tar burning, I must say I have prepared no set paper thereon. Some few years ago I had the pleasure of presenting one to the Association on that subject, and while it may seem like threshing old straw to again bring up the subject, still, as our membership is continually changing, there may be some present who have given this subject no attention. At the present time a condition not a theory confronts a good many of us. The condition is overflowing tar tanks, with little or no demand for the material. The New Haven Gas Company disposes of its tar almost exclusively to the concrete people. On the 1st of December our tanks were filled and overflowing, and a canvass of the tar distillers brought out the fact that they did not want to pay anything like what it was worth for its value as a fuel, so we are now using it in our retort furnaces. The ideal way to consume tar would be with an air blast. I have been ex-

perimenting in this direction for some time, but to the present have met with no marked success. The trouble we find in intruducing the tar with an air blast is that the heat is focused at one point. I have no doubt that somebody will discover a burner adapted to burning tar with an air blast, and until such time we must go on with that which we have got. We are burning tar at the present time with a jet of steam, and no doubt many of you are familiar with this burner. The old method of burning tar without steam was objectionable on account of the difficulty in keeping a sixteenth of an inch stream going. We strain out the large pieces of carbon, but small particles pass through sufficient to clog the small orifice of the old fashioned burner. With the steam jet burner we have no trouble in keeping up a constant stream. We take the tar from the tank with a ¾-inch pipe having a full open valve, and regulate the supply by the steam pressure. If we wish to introduce more tar we turn on more steam. In actual practice in a half-depth furnace we used 200 gallons a day. This is where we are carbonizing 2,000 pounds every four hours. With the solid fuel we would use 72 bushels of coke per day. We find that this is equal to 2¾ gallons of tar per bushel of coke. You can easily figure what the tar is worth as fuel by the market price of coke in your town. With 5 cents a bushel for coke, tar is worth about 92 cents a barrel to burn; with coke at 6 cents a bushel it would be worth $1.08. There is a relief in the fact that we can use our tar up in this way. In old times our Company used to run the tar into the dock, to the great loss and annoyance of the shell fishery interests of our city. Of course we would not be allowed to do that at the present time by the Harbor Commissioners; and there is no occasion for it, because we can sell our coke at some price. If the market price for tar is below its value for fuel we can use it successfully in our furnaces.

Discussion.

Mr. Allyn—Are you using tar in half-depth furnaces only?

Mr. Sherman—Well those are all that we have at the present time. It is a success there. We are using new settings at the present time. We have had it burning two months. As far as I can see, there is no deterioration in the settings. We were on the point of melting them down when we tried it in connection with an air blast.

Mr. Allyn—What did Mr. Sherman say was the market price of tar in New York?

Mr. Sherman—The price we were offered for our tar (1 cent per gallon) was not one that we could entertain. Of course, we know what it is worth to burn, so it is useless to make us any offer less than that.

Mr. Allyn—I don't blame you.

Mr. Neal—Has Mr. Sherman a ready sale for his coke?

Mr. Sherman—We retail it broken at 10 cents, but we are selling it to day in large quantities at 5 cents, and that makes the price of our tar.

Mr. Neal—We cannot get anything like a price for our tar. Are the New Haven chimneys long or short?

Mr. Sherman—Short chimneys.

Mr. Neal—That is the case in our retort house. I tried burning tar some time ago, in the summer time. When the wind was east or southeast it did a great deal of damage to our electric plant, for the cinders or the smoke, or whatever else came from the imperfect combustion of tar, blew into the dynamo building and we had to stop the practice.

Mr. Sherman—We manage our air drafts in such a way that no smoke comes out of the chimneys.

Mr. Gifford—I should like to say for Mr. Neal's information that if he used superheated steam to burn his tar he would have had no trouble with smoke.

Mr. Sherman—In fitting up this burner you must leave a pet cock at the end to draw off the condensing steam. Our boilers are located some 100 yards away from the point where we use the steam, and we leave a little jet of steam blowing out all the time to take off the condensation.

Mr. Addicks—Referring to the diagram of the coal shed I would like to ask Mr. Sherman how it is sheathed from end to end over these trusses. It is a very instructive design.

Mr. Sherman—The plan shows where the 2-inch planking is bolted to the steel frame. The price of iron was so low last year that we could make the frame of steel almost as cheap as we could of wood, and this style of steel truss does away with supports in the center. The dimensions of the shed are 18 feet by 60 feet, and 475 feet long. It is figured to hold 12,000 tons.

Mr. J. J. Humphreys—I would like to ask Mr. Sherman whether the ends of the piles are submerged under water, and if so, what is the distance between the floor level and the ends of the piles? The floor seems to be very close to the water, if the water level covers the piles.

Mr. Sherman—They are. And the piles are, of course, cut down to low water mark, so that at least they are submerged at every tide. There is the plan of the piling.

Mr. J. J. Humphreys—Is the floor above the highest tide?

Mr. Sherman—Certainly; it's above the highest tides we have.

Mr. A. B. Slater, Jr. (Providence, R. I.), at this point explained that, some months ago, a superintendent of one of the stations of the Providence Gas Company instituted a series of experiments in the operation of a Lowe, double superheater water gas plant, and the experimentation was carried on by a beginner (Mr. J. B. Polk) in the Company's service. The results of the trials were handed in by him to the superintendent. Having been requested to report the outcome of the matter to the Association, Mr. Slater asked its indulgence in the instance of waiting a short while for Mr. Polk.

At the suggestion of the President, in the interim of waiting, the

QUESTION BOX

was opened, with the following result:

No. I.—"What is the simplest test to use to detect the presence of carbonyl in gas purified with iron oxide?"

Mr. Shelton—Complaints of customers.

No. II.—"A small gas company has a large number of one, two and three hole hot plates in use among its customers. What is the best plan of getting out cooking ranges to replace them?"

Mr. Sherman—I think Mr. Nettleton can best answer that question, for I understand he has been very successful in replacing hot plates with ranges. The house-to-house canvass appeals most forcibly to me.

Mr. Shelton—Use a "Larned solicitor."

No. III.—"Is it a good thing, or not a good thing—and why?—to store surplus tar in the tank of a small, old gasholder? The holder is still in use. The appearance of the holder working in tar would cut no figure."

Mr. Allyn—I should think "the appearance" would cut a pretty large figure.

The President—I suppose some of our members must have had experience with holders working in tar.

Mr. Coffin—At Chelsea they emptied a holder tank, that tar had been run into for a number of years, at a very high price, as I understood it.

Mr. Prichard—I recall the fact that the late Mr. Stiness had one that was working partially in tar. He painted it with tar. At the time they had the big fire down there it was quite a source of danger. He was afraid the tar coating was going to catch fire.

No. IV.—"Has anyone present used, and with what success, the method of testing for street main leaks described by Mr. W. B. Randall in the AMERICAN GAS LIGHT JOURNAL, December 5, 1898, in which is used a porous diaphragm, through which mixtures of air and gas will pass, which is so arranged that the percentage volumes are indicated by a pointer on a graduated scale?"

There was no reply to this question, nor to—

No. V.—"Has anyone present used, and with what success, the method of testing over crowbar holes with or-palladium, as described by Consul Morris, as in use in Ghent, Belgium, and largely the cause of but a 3 per cent. leakage in that city?"

No. VI.—"What is the most desirable temperature for water gas at inlet to purifiers charged with oxide?"

The President—It seems we must call on Mr. McKay again in answer to that question.

Mr. McKay—We have tried all temperatures, from 140° to 40°, and the desirable temperature depends upon what you are working for. If you want dry gas at a slightly increased expense for purification, the low temperature is desirable. If you have a box of oxide about which you wish to show a fine record, put up the temperature. I think we had something like 200,000,000 between changes one time for a box at 80° temperature. I should say it should be not lower than 50° and not higher than 70°, to keep the purifying material in good shape and free from tar or oil.

No. VII.—"What would be the cost of an acetylene gas burner, equal to that of an 18-candle coal gas light, costing three-quarters of a cent per hour? Cost of calcic carbide $5 per 100 pounds."

The President—No one seeming to be possessed of the required information, I will ask Mr. A. B. Slater, Jr., if his assistant is ready to report the results of the workings at Providence of a water gas set?

Mr. A. B. Slater, Jr.—Mr. President, with your indulgence I would like to introduce one of my assistants, Mr. J. B. Polk. I will say for Mr. Polk that when he began the trial of which he will tell you he knew nothing about water gas making, further than that I explained to him the theory of the process, showed him the manual operating of

the valves and the handling of the set, and then told him, in order to learn how to run a set, to take it and run it himself without any further guidance than simply to see that he did not get into trouble. His paper is the report that he made to me regarding his experiments, and I think it will be interesting to many of those in charge of water gas plants in small works and do not have a chance to make experiments with them.

Mr. Polk then read the following, entitled

A BEGINNER'S EXPERIMENTS IN STUDYING THE OPERATION OF A LOWE WATER GAS APPARATUS.

The figures given herewith are data collected while learning to operate one of the 8 feet 6 inches Lowe water gas sets at the South station of the Providence Gas Company, and are correct for the particular time the measurements were taken; but, from a comparison of the tabulated results with the average results also given for 7 days, it will be seen that the average for 7 days shows a better efficiency, which is probably due to the experience gained while collecting the first data. It will also be noted that the apparatus was not run full time, nor at its full capacity, it being used as auxiliary to the coal gas plant where it would be useless for taking up variations in sendout, if already working to its economical limit. The first object sought was to determine the duration of run which would develop the best efficiency and also the most favorable relative length of time for the blows and runs, and to ascertain the proper and relative opening of the blast valves under different pressures in the blast main. For intelligent comparison of such data, examinations were made as to the quality as well as quantity of gas produced. A great many measurements and analyses not here recorded were made in order to check those herewith given, and to make certain that no material variation passed unnoticed. The fuel used in the generator was coke from the coal gas plant, some of which had been for some time exposed to the weather, and contained about 8 per cent. moisture, occasionally going as high as 11 per cent., thus making the coke account (by weight) higher than if the coke used had been fresh or kept under cover, so as to be fairly dry before charging.

The charges were about 700 pounds every three-quarters of an hour, on running 5 minute blows and runs, and about every hour on 7 minute blows and runs. An extra blow of about 2 minutes was allowed after the coaling, making a 7-minute blow after coaling, when running 5 minutes, and a 9-minute blow after the coaling when running 7 minutes. This method of running so divided the time as to give 4 runs on each coaling, the third run in every 4 being a down run. In addition to the water in the coke, the time the set was run in proportion to the time it was idle must as above mentioned be taken into account in the question of efficiency. The set was on an average run about 9½ hours out of every 24, which, of course, is very different from continuous work. The figures showing rate of make were determined from measurements taken directly on the relief holder; some every 15 seconds and some every minute during the runs in question. I think the tables will explain themselves, and to illustrate the results graphically I have drawn curves from the data given in the tables, using as ordinates the number of cubic feet of gas made, and as abscissas the time run in minutes. Points on the curves are numbered to correspond with the number of the run after coaling. In 3 of the 4 sets of runs given it will be noticed that there was less gas made on the down run than on the others. This is probably due to the lost time in the run in changing the valves, etc.

Tables Showing Rate of Make.

I. *Five-Minute Runs.*

Minutes.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.
1	1,109.40	887.52	665.64	739.60
2	1,257.32	1,183.36	1,183.36	1,035.44
3	1,183.36	887.52	887.52	887.52
4	887.52	813.56	739.60	591.68
5	591.68	221.88	369 80	295.84
Total	5,029.28	3,993.84	3,845.92	3,550.08

II. *Five-Minute Runs.*

Minutes.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.
1	813.56	887.52	739.60	1,109.40
2	1,331.28	1,257.32	1,183.36	1,183.36
3	1,183.36	1,035.44	887.52	961.48
4	887.52	813.56	739.60	739.60
5	517.72	443.76	443.76	443.76
Total	4,733.44	4,437.60	3,993.84	4,437.60

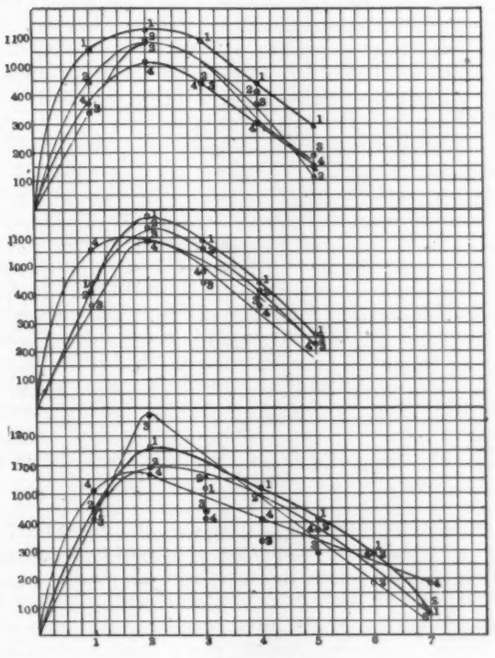


Fig. 1.

III. *Seven-Minute Runs.*

Minutes.	Cubic Feet.	Cubic Feet.	Cubic Feet.	Cubic Feet.
1	813.56	887.52	813.56	1,035.44
2	1,331.28	1,183.36	1,553.16	1,109.40
3	1,035.44	1,109.40	887.52	813.56
4	1,035.44	1,035.44	665.64	813.56
5	813.56	739.60	665.64	739.60
6	591.68	365.80	591.68	591.68
7	147.92	147.92	147.92	369.80
Total	5,768.88	5,473.04	5,325.12	5,473.04

IV.—*Five Minute Runs.*

Minutes.	Cu. Ft.	Cu. Ft.	Cu. Ft.	Cu. Ft.
¼	369.80	369.80	295.84	369.80
½	369.80	369.80	295.84	295.84
¾	369.80	295.84	295.84	295.84
1	369.80	295.84	258.86	295.84
1¼	369.80	295.84	258.86	295.84
1½	332.82	295.84	221.88	221.88
1¾	332.82	295.84	221.88	221.88
2	295.84	221.88	221.88	221.88
2¼	295.84	221.88	221.88	184.90
2½	295.84	221.88	184.90	221.88
2¾	258.86	221.88	184.90	184.90
3	221.88	221.88	184.90	184.90
3¼	258.86	184.90	147.92	184.90
3½	221.58	184.90	147.92	147.92
3¾	258.86	184.90	147.92	147.92
4	221.88	184.90	110.94	147.92
4¼	184.90	184.90	110.94	147.92
4½	184.90	147.92	73.96	147.92
4¾	73.96	147.92	73.96	110.94
5	36.98	110.94	73.96	36.98
Total....	5,325.12	4,659.48	3,734.98	4,067.80

Averages in Cubic Feet.

Minutes.	Eight 5-Min. Runs.	Four 7-Min. Runs.	Four 5-Min. Runs.
1	869.04	887.52	1,303.54
2	1,201.85	1,249.30	1,081.67
3	989.21	961.48	878.28
4	776.58	887.52	721.11
5	416.02	739.60	462.25
6	....	536.21	....
7	....	203.39	....
Totals..	4,252.70	5,510.02	4,446.85

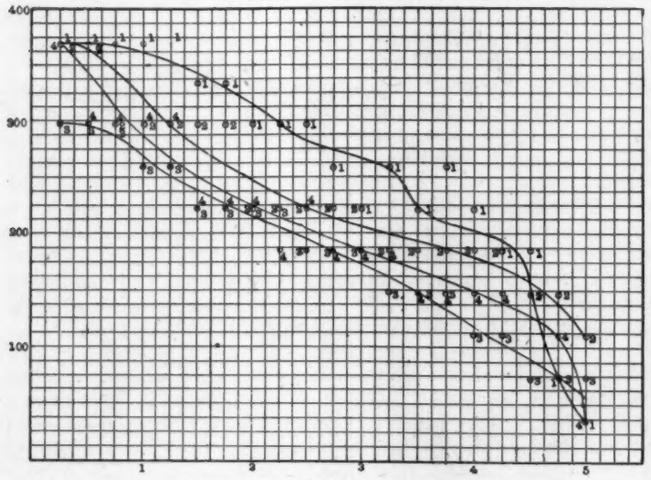


Fig. 2.

From these averages we see that the last two minutes of the 7-minute run does not give enough additional make to pay for the time taken. The advantage of the 5-minute run over the 7-minute run may also be seen by comparisons of the average productions per minute. The average per minute during the 5-minute run (5-minute blow) is 850.54 cubic feet, while that for the 7-minute run (7-minute blow) is 787.15 cubic feet, an advantage of 63.39 cubic feet per minute for the 5-minute run. The difference is even more marked with the 5-minute run and 6-minute blow, which is the third average in the table. This shows an advantage of 102.22 cubic feet per minute over the 7-minute run. The average production per minute for the 5-minute run with 6-minute blow is 889.37 cubic feet, which also shows an advantage over the 5-minute run with 5 minute blow of 194.15 cubic feet, or an average of 38.83 cubic feet per minute. In order to know something of the quality of the gas made, I took samples from the top of the generator and from the outlet of the condenser, thus obtaining the uncarbureted and also the carbureted water gas. The sample from the top of generator was taken during each of the three up runs, by allowing a large aspirator to empty itself of one-third of its water on each run, thus getting a sample of the three runs during the corresponding conditions of the fire. Three portions, each 100 c.c., were then taken of this sample for analysis; large numbers of these samples were taken to make sure that the conclusions were correct. The samples from the outlet of the condenser were taken in the same way, but during all four runs on each coaling, and the analyses made in a similar way. The following are the average results, the individual analyses differing very little. The carbureted gas was, of course, unpurified, which accounts for the large per cent. of sulphur compounds and nitrogen, for which the gas was not analyzed. The specific gravity was determined by effusion.

Analysis of Gas.

Uncarbureted, Sp. Gr., .592.		Carbureted, Sp. Gr., .740.	
CO_2	6.4 per ct.	CO_2	4.8 per ct.
CO	36.4 "	$C_n H_{2n}$	18.2 "
H_2	49.8 "	CO	22.1 "
$H_2S + CS_2 + N_2$	7.4 "	CH_4	18.7 "
....		H_2	28.8 "
....		$H_2S + CS_2 + NH_3 + N_2$	7.4 "
	100.0		100.0

The candle power of the gas, of course, varied somewhat during each run, but the runs did not differ materially from each other, the average candle power as determined being 30.65.

The most advantageous method of running was found to be with 6-minute blows and 5-minute runs, with a blast pressure of about 10 inches in the mains and half opening of the blast valves—12-inch valve on the generator blast pipe, 6 inch valve on carbureter, and 8 inch on superheater. With this pressure of 10 inches in the blast main and half opening of the valves the following pressures obtained.

Pressures.

Pressure under fuel	9½ inches.
Pressure at top of carbureter	8⅝ "
Pressure under arch in superheater	7½ "
Pressure under stack valve	6 "

Average steam pressure was 95 pounds during the run.

During seven days of running (the number of hours a day mentioned above) the average of 297 runs showed 4,827 cubic feet of gas made per 5-minute run, on 36.6 pounds of coke per 1,000, and 5.32 gallons of oil (naphtha) per 1,000, giving a candle power of 30. Deducting 8 per cent. for water in coke, the average would be 33.6 pounds of coke per 1,000. The average make per minute was 965 cubic feet, this being 76 cubic feet per minute higher than the trial average.

The gross weight of matter discharged from ashpit of generator was 13.37 per cent. of coke charged, and one-fifth of this was recovered as fuel to be recharged; add 8 per cent. for moisture, and this leaves 78.63 per cent. fuel charged, or 28.78 pounds of fuel net, used per 1,000 cubic feet of gas made.

I concluded from the figures given above that the most advantageous time of running was 5 minutes—*i. e.*, more gas can be made with the same amount of fuel in a given time by running 5-minute runs than by running longer.

In connection with the above results some data in regard to blast pressures were obtained. The blast pressure was started at 9 inches in the blast main, and, in separate trials, increased by 1-inch additions up to 13 inches.

Samples of the blast gases from the top of the generator were taken during every blow of a coaling, at each pressure (except at 9 inches), and also an average sample of the four blows of a coaling. The average sample was obtained, as in the previous cases, by allowing a large aspirator to empty itself of one-fourth of its water during each blow.

The samples were taken in the manner above stated, both with full opening of the blast valves and with half opening. Annexed hereto is a table, giving the various blast pressures obtained in different parts of the set.

Tables of Blast Gas Analyses.

	Valve Opening, Full Blast.						Valve Opening, Half Blast.					
No. of blow...	1	2	3	4	1—4		1	2	3	4	1–4	
Pressure (ins.).	9	9	9	9	9	9	9	9	9	9	9	9
Time of blow..	6	5	5	5	5	5	6	5	5	5	5	5
Per cent. CO_2..	....	11.2	10.2	....	11.4	10.9	11.4	....	....	9.8	11.4	10.9
Per cent. CO..	....	13.6	15.2	....	13.6	14.2	13.2	....	....	16.8	15.0	15.0
Per cent. N_2...	....	75.2	74.6	....	75.0	74.9	75.4	....	....	73.4	73.6	74.1
Pressure (ins.).	10	10	10	10	10	10	10	10	10	10	10	10
Time of blow..	7	5	5	5	5	5	7	5	5	5	5	5
Per cent. CO_2..	6	12.0	12.2	11.4	10.4	10.4	4.8	12.0	11.4	12.4	10.2	10.1
Per cent. CO..	23.2	11.6	12.0	13.2	13.5	14.7	23.0	12.0	12.4	10.7	14.7	14.6
Per cent. N_2...	70.8	76.4	75.8	75.4	76.1	74.9	72.2	76.0	76.2	76.9	75.1	75.3
Pressure (ins.).	11	11	11	11	11	11	11	11	11	11	11	11
Time of blow..	7	5	5	5	5	5	7	5	5	5	5	5
Per cent. CO_2..	6.4	10.6	11.7	10.4	10.0	9.8	4.2	9.5	13.0	11.8	11.6	10.0
Per cent. CO..	19.8	13.6	11.0	15.0	15.2	14.9	26.6	16.2	10.6	13.9	15.0	16.5
Per cent. N_2...	73.8	75.8	77.2	74.6	74.8	75.3	69.2	74.3	76.4	74.3	73.4	73.5
Pressure (ins.).	12	12	12	12	12	12	11¾	11¾	11¾	11¾	11¾	11¾
Time of blow..	7	5	5	5	5	5	7	5	5	5	5	5
Per cent. CO_2..	7.8	8.2	13.0	13.4	10.5	10.6	4.6	13.4	12.5	13.2	11.1	11.0
Per cent. CO..	19.7	18.4	10.0	10.0	13.7	14.3	24.5	8.4	11.1	9.2	13.8	13.4
Per cent. N_2..	72.5	73.4	77.0	76.6	75.8	75.1	70.9	78.2	76.3	77.6	75.1	75.6
Pressure (ins.).	13	13	13	13	13	13	12½	12½	12½	12½	12½	12½
Time of blow..	6	4	4	4	4	4	6	4	4	4	4	4
Per cent. CO_2..	8.0	12.8	13.2	13.6	11.4	11.8	8.4	13.0	13.5	12.4	12.2	11.9
Per cent. CO..	18.2	10.6	9.6	8.6	12.4	11.9	16.8	8.2	8.3	9.2	10.1	10.5
Per cent. N_2...	73.8	76.6	77.2	77.8	76.2	76.3	74.8	78.8	78.2	78.4	78.0	77.6

In the tables giving the results of the analyses of the blast gases, the figures 1, 2, 3 and 4 at the head of the columns designate the number of the blow after a coaling; the column headed 1–4 gives the average sample of the four blows on a coaling. The time of blow is given in minutes. In most every case the average of the four individual per cents of CO_2, CO and N_2 is very close to the per cent. obtained in the average sample. The sixth column gives the average of the five preceding ones, which shows that the *total* per cents of CO_2 and CO on the four blows are nearly the same for all of the pressures tried. It will be seen from the tables, however, that the per cent. of CO_2 was much smaller, and the per cent. of CO much larger on the first blow than on the others. The make of gas was figured from day to day, and a slight increase noticed with the increased blast pressure. This I supposed to be on account of the increased temperature of the generator due to the greater quantity of air passing through the fire in a given time, so I concluded the generator would handle more steam with the increased blast pressure, and accordingly increased the

amount of steam admitted as far as economy permitted. The results from measurements taken on the relief holder will show this increase in make. At the time the measurements were taken the water gas exhauster was running.

In order to determine how much gas was going out of the holder during the time the run was on, the fall of the holder was measured during the five minutes before the run and five minutes after the run, and the average of the two taken as the amount which would go out of the holder during the five minutes the run was on. This would not be quite true, for the temperature of the air was about 13° F. lower than the temperature of the gas at the outlet of the condenser. There may have been some slight condensation in the holder also. So, to account for these two, I subtract 5 per cent. from each run so as to make a good, generous allowance for losses. On measurements in one day of 40 runs, after deducting the above mentioned 5 per cent., I obtained an average of 5,264 cubic feet per 5-minute run, on about 36 pounds gross of coke per 1,000. In the early part of the day the make was very much below the average, which may be accounted for by the set being idle for so long a time the day before, it only having been run the first 6 hours out of the 24. The third day measurements were taken on the first 14 runs of the day, and gave an average of 6,016 cubic feet per 5 minute run, making no deduction for temperature, as the temperature of the atmosphere was nearly that of the temperature of the gas at the outlet of the condenser.

Other measurements were taken to show the make for different times of blowing, and from the following table it will be seen that (running 5 minutes in all cases) the make per minute the set was in operation was greatest with the 5-minute blow.

Cu. Ft. 7-Min. Blow.	Cu. Ft. 6-Min. Blow.	Cu. Ft. 5-Min. Blow.	Cu. Ft. 4-Min. Blow.
(1) 6,376	(2) 6,090	(3) 5,803	(2) 5,325
(1) 6,018	(4) 6,018	(2) 5,917	(3) 5,605
(2) 6,305	(1) 5,991	(1) 5,695	(4) 4,703
(3) 6,161	....	....	....
(4) 6,328	....	....	....
Average.... 6,238	6,033	5,805	5,211
Per minute operating. 520	548	580	579

In the table just given the figures in parentheses indicate the number of the run after coaling.

The average figure given above for the make per run on 40 runs (5,264 cubic feet) was above this every day for a week following by about 500 cubic feet, in no case falling below 5,500 cubic feet per run, on about 36 pounds gross of coke.

Following is the table of blast pressures obtained in the set from the different blast main pressures, and with half opening and full opening of the blast valves—F. O. = full opening of blast valves; H. O. = half opening of blast valves:

Pressures.	F.O.	H.O.	F.O.	H.O.	F.O.	H.O.	F.O.	H.O.	F.O.	H.O.
Under fuel.....	9″	..	10″	10″	11″	11″	12″	11¼″	13″	12¼″
Top of carbureter	..	..	9″	8¾″	10½″	10½″	11½″	10½″	12″	10¾″
Under superheater arch.....	..	..	8½″	8¼″	10″	9½″	10¾″	9¾″	11½″	10″

Accompanying is a sheet of figures for an entire week, following the period when the above results were obtained. In this table are some figures on the boiler in the water gas plant. It is a horizontal, return-tubular boiler, 50 inches in diameter and 15 feet long, and has 56 tubes, 2¾ inches in diameter. It has a heating surface of 702.93 square feet and grate area of 20 square feet. The figures given for evaporation are for the temperature and pressure of the feed as entering the heater.

In the regular order of running the set, the boiler which supplies the set with steam also supplies the blower engine, oil pump, water pump, exhauster, etc., so that the amount of steam ussd in the set is undetermined. In order to estimate this item the steam pipe connections were so arranged as to supply steam to the set from another source, while the water gas plant boiler supplied the blower engine, pumps, etc.

The first day the set was run 7 hours and 40 minutes, and the amount of steam used in the engine room was 15,523.75 pounds, and 208,000 cubic feet of gas were made, making 74.63 pounds of steam used in engine room per 1,000 cubic feet of gas made. While the water gas plant boiler was supplying the set as well as the machinery in the engine room, the average amount of steam used for four days' running (set run 7 hours and 40 minutes per day, pumps, exhauster, etc., 24 hours), was 100 pounds per 1,000 cubic feet of gas made. So that the amount of steam used in the set per 1,000 cubic feet of gas made is, in this test, 100 — 74.63 = 25.37 pounds.

On the second trial day the amount of steam used to supply the engine room was 64 pounds per 1,000 cubic feet of gas made. Taking the average of five days, running a corresponding time (8 hours and 20 minutes), the amount of steam used per 1,000 cubic feet of gas made was 91 pounds, for set and engines, pumps, etc. So that the amount of steam used in the set, for this trial, per 1,000 cubic feet of gas made, was 91 — 64 = 27 pounds.

For the third trial, on a running of 9 hours and 15 minutes, the amount used in the set was 33 pounds of steam per 1,000 cubic feet of gas made.

Taking the average of the three trials, the result is 28.46 pounds of steam used in the set per 1,000 cubic feet of gas made.

From an analysis of the gas I obtained the following: CO_2, 4.4 per cent.; CO, 27.7 per cent.

Considering the amount of O_2 in the CO and CO_2 to come from the steam, we can figure the amount of water in the gas in the form of H_2, CO and CO_2: $\frac{8}{11}$ by weight of CO_2 is O_2; $\frac{4}{7}$ by weight of CO is O_2.

One cubic foot of CO_2 weighs .112 of a pound.
" " CO " .0709 "

Per 1,000 Cu. Ft.

The weight of O_2 in CO_2 is $44 \times \frac{8}{11} \times .112 = 3.584$ pounds.
" " O_2 in CO is $277 \times \frac{4}{7} \times .0709 = 11.222$ "

The weight of O_2 in CO and CO_2 ..... = 14.806 pounds.

One-ninth by weight of H_2O is H_2, so that the remaining $\frac{8}{9}$ is O_2, in this case 14,806 pounds, so that the amount of H_2O in the gas is $\frac{9}{8} \times 14.806 = 16.657$ pounds per 1,000 cubic feet of purified, carbureted water gas.

I next found the heat of combustion of 1 cubic foot of this purified carbureted water gas. The heats of combustion of the different constituents of the gas are:

Gas.	Heat of Combustion.	Per Ct. in Water Gas.
CO.....	4,478	27.7
H_2.....	61,500	26.6
$C_n H_{2n}$	21,000 (about)	12.6
CH_4.....	24,000	19.0

1 pound of H_2 contains 188 cubic feet.
1 " CO contains 13.46 cubic feet.
1 " C_nH_{2n} contains about 18.00 cubic feet.
1 " CH_4 contains 23.50 cubic feet.

Results for Week ending May 7, 1898.

Date.	Material for Gas Making and Gas Made.									Fuel and Water for Boiler.					
	Time of Operating Set.	Thousand Cubic Feet of Gas Made.	Cubic Feet of Gas Made per Hour.	No. of Runs Made.	Cubic Feet of Gas Made per Run.	Pounds of Coke Used in Generator.	Pounds of Coke Used per 1,000 Cubic Feet of Gas Made.	Gallons of Oil Used.	Galls. of Oil Used per 1,000 Cubic Feet of Gas Made.	Pounds of Fuel Used Under Boiler.	Pounds of Fuel Used per 1,000 Cubic Feet of Gas Made.	Pounds of Water Evaporated in Boiler.	Pounds of Water Evaporated per Pound of Fuel.	Pounds of Water Ev'porat'd per Sq. Ft. of Heating Surface per Hour.	Pounds of Water Ev'porat'd per Sq. Ft. of Grate Surface per Hour.
May 1.....	6h. 10m.	179	29,027	30	5,967	5,576	31.15	755	4.22	3,760	21.00	25,771	6.85	3.06	107
" 2.....	4h. 50m.	122	25,103	21	5,810	4,547	37.27	506	4.15	3,720	30.49	22,152	5.95	2.63	92
" 3.....	9h. 25m.	261	27,717	45	5,800	9,697	37.15	1,117	4.28	6,160	23.22	24,211	3.93	2.87	101
" 4.....	6h. 25m.	172	26,805	30	5,733	6,704	38.98	804	4.67	3,920	22.21	23,962	6.11	2.84	100
" 5.....	9h. 40m.	274	28,345	48	5,708	9,604	35.42	1,333	4.86	4,960	18.10	30,888	6.23	3.66	129
" 6.....	5h. 45m.	158	19,750	27	5,852	6,320	40.00	629	3.98	3,760	23.80	25,397	6.75	3.01	106
" 7.....	9h. 15m.	251	27,135	45	5,578	9,332	37.17	1,334	5.31	4,960	19.76	28,517	5.75	3.38	119
Averages.....	.....	.....	26,269	.....	5,778	.....	36.73	.....	4.50	.....	22.65	.....	5.94	3.06	108

$\frac{26.6 \times 61,500}{188} = 8,650$ Heat units in H_2.

$\frac{27.7 \times 4.478}{13.46} = 9,220$ " " CO.

$\frac{19 \times 24,000}{23.5} = 19,400$ " " CH_4.

$\frac{12.6 \times 21,000}{18} = 14,700$ " " C_nH_{2n}.

Total = 51,970 heat units in 100 cubic feet of purified, carbureted water gas, which, divided by 100, gives 519.7 B. T. U. per cubic foot.

Discussion.

Mr. Neal—I regret this paper was presented too late in the session to allow any discussion upon it, owing to the fact that the time for our proposed visit to the Everett gas and coke plant is almost reached. I shall read the paper when printed with a great deal of interest.

The President—The regret expressed by Mr. Neal I have no doubt is shared by every member ef the Association.

On motion of Mr. Sherman, it was ordered that the paper be printed in pamphlet form and distributed among the members at the expense of the Association.

On motion a vote of thanks was tendered to Mr. Polk.

On motion of Mr. Wood it was ordered that next year the questions for the question box be printed before the meeting, or that the questions be bulletined in the meeting room at the close of the first day's session, so that they might be answered intelligently.

On motion of Mr. Sherman a cordial vote of thanks was tendered to the officers, in which motion especial reference was made to the continued, successful and unselfish efforts of the retiring Secretary, Mr. Charles F. Prichard.

The President thereupon declared the meeting adjourned.

ABSTRACT OF PROCEEDINGS, SIXTH ANNUAL MEETING, MICHIGAN GAS ASSOCIATION.

HELD IN LANSING, MICH., FEB. 22 AND 23, 1899.

FIRST DAY—FEB. 22—MORNING SESSION.

The meeting was called to order at 10 A.M., Feb. 22, in the parlors of the Hotel Downey, by the President, Mr. C. H. Raynor, of Adrian, Mich. The following members responded to their names on

ROLL CALL.

Honorary.

Callender, E. P., New York City.

Active.

Baxter, I. C., Detroit, Mich.	Knight, J. J., Kalamazoo, Mich.
Begole, C. M., Flint, Mich.	Lynn, J. R., Benton Harbor, Mich.
Bostwick, W. J., Ypsilanti, Mich.	Lynn, J. T., Detroit, Mich.
Calkins, J. M., Big Rapids, Mich.	Latta, L. M., Goshen, Ind.
Church, L., Flint, Mich.	Morgans, W. H., Pontiac, Mich.
Dawes, B. G., Lansing, Mich.	Neuendorf, C., Saginaw, Mich.
Douglas, H.W., Ann Arbor, Mich.	Raynor, C. H., Adrian, Mich.
Dean, S., Ann Arbor, Mich.	Sterling, J. C., Monroe, Mich.
Eaton, W. M., Jackson, Mich.	Tippy, B. O., Grand Rapids, Mich.
Freese, F. W., Albion, Mich.	Walbridge, H. D., Detroit, Mich.
Gallagher, E. F., Ionia, Mich.	Walker, L. E., Lansing, Mich.
Hess, F. H., Ann Arbor, Mich.	Woodbury, E., Kalamazoo, Mich.
Howden, J. J., Muskegon, Mich.	Wolff, S. E., Jackson, Mich.
Howden, F. J., Muskegon, Mich.	Zwisler, A. L., Coldwater, Mich.
Hyde, H. H., Saginaw, Mich.	

Associate.

Bonney, W. P., Erie, Pa.	Harris, G. E., Chicago, Ills.
Cressler, A. D., Fort Wayne, Ind.	Hoagland, E. H., Chicago, Ills.
Corbus, F. G., Chicago, Ills.	Osius, G., Detroit, Mich.
Eaton, A. B., Chicago, Ills.	Persons, F. R., Toledo, O.
Guldlin, O. N., Fort Wayne, Ind.	Wickham, L., St. Louis, Mo.
Harper, H. D., Chicago, Ills.	

The reading of the minutes of the last meeting having been dispensed with, Secretary Hyde read the following

REPORT OF THE EXECUTIVE COMMITTEE.

Gentlemen: Your Executive Committee has to recommend to membership in this Association the following named gentlemen:

Active.

Douthirt, W. F., Jackson, Mich.	Gale, A. A., Albion, Mich.
Doty, Paul, Grand Rapids, Mich.	Hellen, J., Grand Rapids, Mich.
Frazer, D. H., Battle Creek, Mich.	Hyde, E. A., Menominee, Mich.
Goldsmith, W. G., Benton Harbor-St. Joseph, Mich.	Speer, R. I., Lansing, Mich.
	Willson, J. C., Flint, Mich.

Associate.

Auger, H. B., Detroit, Mich.	Moon, J. R., Piqua, O.
Collins, H. W.	Pier, W. H.
Henderson, E. H., Pittsburg, Pa.	Weston, J. A., Detroit, Mich.
Lowry, R. H. P., Erie, Pa.	Young, P., Detroit, Mich.
McClelland, G. B., Cleveland, O.	

The following resignations from active membership have been handed to the Secretary: Cooley, E. F., Lansing, Mich.; Edick, C. M., Benton Harbor, Mich.; Hooker, H. E., Charlotte, Mich.; Morton, J. S., Benton Harbor, Mich.; Ward, J. M., Battle Creek, Mich. From associate membership: Holmes, F., Milwaukee, Wis.; Randle, C. H., Chicago. For Nominating Committee the following are recommended: Messrs. W. M. Eaton, E. F. Gallagher and John R. Lynn. The papers to be read at this meeting are: "The Importance of Proper Boiler Settings in Water Gas Plants," by Mr. John R. Lynn; "Pitch in Hydraulic Mains," by Mr. B. O. Tippy; "A Desirable Increase and Its Source," by Mr. S. E. Wolff; "How Do We Obtain our Patrons," by Mr. A. L. Zwisler; "The Use of Gas for Other Purposes than Fuel," by Mr. Henry W. Douglas. Respectfully submitted,

C. H. RAYNOR,
L. E. WALKER,
H. W. DOUGLAS,
} Committee.

On motion, the report was received and adopted.

REPORT OF SECRETARY AND TREASURER

showed a membership (to Feb. 20, 1899), of 87. The financial statement showed receipts for the year amounting to $229.80, expenditures of $94.36, and a balance of $135.44. The

REPORT OF THE SPECIAL COMMITTEE ON COAL TAR

was called for. A motion, to put it over until the following day, then to be discussed under the head of miscellaneous business, prevailed. President Raynor next read his

INAUGURAL ADDRESS.

(For Address, see JOURNAL, *ante*, 336.)

On motion, Secretary Hyde appointed Messrs. I. C. Baxter, Paul Doty and W. J. Bostwick a Committee to consider and report upon the President's address.

The President appointed the following committees:

Next Place of Meeting.—Messrs. J. J. Howden, H. D. Wallbridge and L. M. Latta.

Resolutions.—Sedgwick Dean, F. H. Hess and J. T. Lynn.

The Secretary read a letter from President S. J. Fowler, of the New England Association of Gas Engineers, regretting his inability to attend the sessions; a letter from Mr. T. C. Jones, Secretary of the Ohio Gas Light Association, inviting the Michigan Association to meet with the former at the coming Springfield meeting; and an acknowledgment and good wishes from Mr. A. C. Humphreys, President of the American Gas Light Association. On motion of Mr. L. E. Walker the Secretary was requested to suitably reply to the Ohio Association's invitation. At this point President B. G. Dawes, of the Lansing (Mich.) Gas Light Company, through its Secretary and Superintendent (Mr. L. E. Walker), extended a very cordial invitation to the Association to meet with them at a banquet to be held in the hall of the Hudson House, the evening of the following day. The invitation was accepted. Mr. F. R. Persons suggested that as many members of the Association as possible should attend the meeting of the Ohio Association, for at that meeting the subject of "Municipal Control" was to be thoroughly discussed.

The President introduced Mr. John R. Lynn, of Benton Harbor, Mich., who read the following paper on

THE IMPORTANCE OF PROPER BOILER SETTINGS IN WATER GAS PLANTS.

In observations dating through several years the writer has noted the almost general application of a false economy in the provision of power for average size water gas plants. Proper attention to this very impor-

tant subject is so seldom manifest in the construction of such plants that, when but a few weeks ago my reluctant consent to contribute something for the consideration of this Association was given, a recent experience was still so vivid in my mind that, in the perplexity attendant upon an effort to find a more appropriate subject, it was finally considered in this selection you might at least find something of interest.

First of all, I would impress upon you the fact that I have always deemed it inadvisable to attempt the operation of a works of this description with a single boiler, no matter what power it may be capable of developing. One of my first recommendations made to the Company at Benton Harbor had for its purpose the installation of an additional boiler of greater capacity than the one found alone in service when my management of the works there was assumed. In previous situations a practical experience with the common power developer had given me a decided opinion of its vast importance, which circumstances have taught was no exaggerated one.

As you are well aware, the consolidation of two opposition companies found the Company with which I am now connected in the possession of two gas plants. In each of these but one boiler had been employed, and when, for economic reasons, one of the plants was made inactive, it was decided at the earliest possible date to remove the boiler from there to the works in operation in order to provide for any future emergency. It might be explained here that about the only thing we ever could make practical use of in the fuel gas plant, which came into existence heralded as a revolutionary agent, was a splendidly built, upright fire tube boiler, capable of producing 60-horse power. However, the pressure of other construction work was such as to cause a longer delay in its removal than was at first anticipated with a result which might have proved disastrous.

One morning in the early days of October I happened, in passing the boiler—a 30 horse power affair of the horizontal fire-tube type—to stoop down and glance into the fire door. The first thing that met my gaze was a well developed blister about the size of a goose egg on the forward bottom plate, where the heat was at the time quite intense. Such a discovery at such a time was hardly calculated to cause the most pleasant feelings imaginable, but it was the means of putting a certain man on that particular day, and a few succeeding ones, into very rapid action.

Three days were required to dismantle the inactive boiler, to cut a hole in the building sufficiently large to remove it and to get it across town. Another day was consumed in getting it firmly set on a concrete foundation and properly connected. Those days and nights were not of that description easily to be forgotten, and the work necessitated was accomplished in the time specified only by almost continuous labor. When the steam gauge on the new adjunct to our producing plant registered a pressure of 90 pounds, there was a man in my most immediate vicinity who felt one of the greatest reliefs of a lifetime. From the time the trouble became apparent until that time we had been struggling along with 50 pounds of steam and the lightest fire possible.

Some of the most interesting developments in the whole matter were brought out later on. Our immediate attention was given to placing the crippled boiler in first-class condition, and to do this we deemed it expedient to make a thorough overhauling.

The first thing ascertained was that the boiler had been set 4 inches low on the front end, although the blow-off or mud valve was at the rear. It has seemed miraculous to me that four years were required to form a blister, as it would seem impossible to have operated under such a condition without depositing in the portion exposed to the most intense heat sufficient scale to produce a similar trouble in a much shorter space of time.

Upon examination the water column was found to be 6 inches lower than it should have been, and that, during the four years of its operation, 2 gauges of water, ordinarily indicating an entirely safe height, left the upper row of flues exposed to a high heat on the rear and toward the firebox itself.

That setting is somewhat different now, and, while the first discovery of the troublesome blister placed me upon the anxious seat and caused me to view the matter as a misfortune, it is now looked upon as an occurrence which really placed the writer in line for self congratulation. My belief in the proverbial lucky star has in a general way had no foundation, and is, therefore, not deeply rooted; but Providence was certainly most favorable to us in this one circumstance, in that we were not left with but one boiler, and that about a mile from our works, whereas we are now the lucky possessors of two in fairly good condition.

In passing over this matter one other defect in the old arrangement is worthy of some attention. A conglomerate area of the cross sections of the flues gave, upon calculation, a total of 266 square inches, while the area of a cross section of the stack employed measured less than 150 square inches. The result was that a very short time was required to burn out grate bars, the false economy in stack construction being a source of expense which could easily have been avoided.

My objects in the production of this paper are to bring into relief several well defined rules for the consideration of our members.

1st. In the construction of water gas plants provide boilers of sufficient number and ample capacity to avoid any disastrous effects from an accident to one in use.

2d. See that your boilers are properly set, with water columns, safety valves, blow-offs, etc., properly connected, and that flues are given correct dimensions.

3d. In order to satisfy yourself of the true condition of your boilers, provide for careful and expert inspection at regular intervals.

The reasons for the first rule are obvious and require but slight comment. There are, however, a number of water gas plants which do not require daily operation, and slight repairs, cleaning, etc., can be accomplished without inconvenience, even with only one boiler installed. It is well, however, to consider the danger of more serious happenings and provide for them when all things are apparently going well. Even in a works producing coal gas exclusively, where less power is required, and it is even possible to continue operations for some time with no power at all, the manager who finds himself provided with a reserve boiler may occasionally, in the cold winter season, find the same a great convenience.

My reasons for the second rule are very apparent in the recital of an experience of the past few months, and there is no occasion for further argument in its support.

In regard to boiler inspection, in my individual opinion, and in that a goodly number will agree, the inspection provided by the placing of an insurance policy with some good reliable company, which makes such insurance a specialty, is undoubtedly the safest and best. My faith in insurance inspection is derived from a knowledge of the care taken to ferret out all defects by those who are assuming a risk not lightly to be considered, and by the well known character of the men the companies employ to make the inspection.

Larger municipalities are giving this matter attention and providing official boiler inspection, but there is in that probably the same taint attached to most political positions. The inspectors are quite liable to owe their appointments to political influence almost entirely, and prove grossly incompetent to properly discharge the duties imposed upon them. Upon such inspection no great reliance can be placed, and it is, therefore, necessary to look for the correct article elsewhere. The writer is not here as a representative of any particular boiler insurance company, and would not advise any fellow gas manager to invest in anything from which he would not be fully recompensed. My interests and yours in this matter, as in all others of a business nature, are coincident, and if it be possible for me to present a solution for any problem which may perplex a friend, that friend is welcome to the solution. For the first time in the history of the gas business in Port Huron the Gas Company carries insurance upon its boilers covering loss by damage to either life or property, and the expense attached is so slight that the good and regular inspection obtained by the maintenance of the policy amply repays for all outlay. As long as the present management is retained that policy or a similar one will be in existence. If there should be an occasion for reduction in expenditures, it can be made with less risk in some other quarter.

There are times when the average gas manager finds his time employed to a full extent with other matters, and is not able to give much of his attention to the condition of boilers and kindred apparatus. At such times it is a great relief to know that your boilers get an inspection from men who hold positions upon their merits and ability, and that, as the matter is taken to a great extent off your own mind, you have an assurance that the probability of things going right is greater than the possibility of them going wrong.

While the matter is somewhat foreign to the subject of this paper, the relative value of fuels for steam production is of importance to every superintendent of a gas plant. For the benefit of those of our number who have had no opportunity to give their personal attention to practical testing of various common fuels, the tables given below are presented. These are actual results, obtained by the writer at Detroit, in the month of February, 1896, and are as correct as practical work and the apparatus at hand could make them.

The boiler used for the purpose was a 60-horse power horizontal boiler isolated from the remainder of the battery, the safety valve set at 60 pounds, and the test was made from the time blowing commenced un-

til it ceased after a certain specified amount of fuel in each case had been consumed. From the best of my recollection the stack draught indicated a water vacuum of one-half inch, and the temperature of gases in the stack averaged about 750°. This explains the variation from the theoretical heating capacity of an average coal, 1 ton of which should evaporate about 28,400 pounds of water at 212°.

Below are given the fuels tested, with grades of each, price, evaporation per ton and cost of evaporation of 1,000 pounds of water.

Fuel and Grade.	Cost per Ton.	Evaporated from and at 212°.	Cost per 1,000 Pounds Water.
Youghiogheny (mine run)	$3.00	15,334 pounds.	$.1956
" (slack)	2.50	12,716 "	.1966
" (lump)	3.50	17,270 "	.2027
Hocking Valley "	2.50	13,286 "	.1882
Jackson Hill "	2.75	12,674 "	.2170
Bellmore "	2.75	16,306 "	.1686
Massillon "	2.75	15,192 "	.1810
Turkey Knob (mine run)	2.85	16,686 "	.1708
Anthracite (chestnut)	5.75	17,264 "	.3336
" (egg)	5.50	15,488 "	.3551
Gas coke (lump)	4.00	12,588 "	.3178

The prices quoted are the retail prices in that market at the time the tests were made, and the table will serve to give you the relative value by computation upon any quotation made upon the various combustibles mentioned above.

The same boiler was afterward fitted for natural gas in order to test the relative values of the Sloan and Clayborne burners, both of which had been recommended for boiler purposes. In each test 20,000 cubic feet of gas were consumed, and the following results were obtained, the cost of gas being assumed at 25 cents per 1,000 cubic feet:

Sloan, evaporation per 1,000 c. f., 646.01 lb. Cost per 1,000 lb., $.3870.
Clayborne, " " " 536.92 lb. " " .4656.

The grate surface under the boiler which was used for these tests was rather excessive, being about 16 square feet in area. We worked with the damper almost entirely closed, and the most satisfactory fuel, considering the time required, proved to be the Youghiogheny lump. The greatest amount of clinker and ash appeared from the use of the Ohio groups—viz., Hocking Valley, Jackson Hill and Massillon. In a furnace especially adapted to its use there is no doubt that results with hard coal would have been more favorable—a matter, however, of small consequence, as it cannot seriously be considered for such a purpose in this market.

Approximately, it may be assumed that one ton of bituminous coal, as a heating agent under boilers, where work is regular and constant, is equivalent in effect to each of the following: About 1½ cords of average dry wood (equal in weight to about 4,500 pounds), 2,500 pounds of gas coke, 200 gallons of coal tar, 180 gallons of petroleum, or 25,000 cubic feet of natural gas. The relative value as a fuel for such a purpose must be based upon the price paid for each of these materials. A manufactured gas is entirely out of the question, a few false prophets to the contrary notwithstanding.

The difference between the Clayborne and Sloan burners was that the former consisted of a single open burner, entering the center of the boiler front about 8 inches below the bottom of the shell, and steam was used as an injecting agent, while in the latter there was a series of open burners arranged along each side of the furnace beneath the shell, and the gas was admitted without the aid of an injector. The latter was much the superior arrangement, and we had no hesitancy in recommending it to consumers.

In summing up the whole matter it must be considered that, to correctly estimate the cost of firing liquid or gaseous materials, some allowance must be made in the average steam plant for a reduction in labor expense, wear and tear upon tools, etc.

In concluding, I sincerely hope that the topic as treated may be of benefit to my associates and to our common industry.

The ensuing discussion was an excellent one, much comment in favor of the boiler insurance suggestion being brought out. Another feature of the debate was connected with the use of water gas tar as fuel under retorts and in boiler furnaces. The 10th question in the Question Box—"At what price per gallon can tar be used for bench or boiler fuel economically?"—was discussed in connection with Mr. Lynn's paper. In the debate it was stated that one gallon of water gas tar properly used as fuel under retorts was equivalent to one pound of coal, but the supply must be even, and the supplying pipe should be jacketed, in front of the bench, to prevent baking.

Some Telegrams.

Mr. Fred. R. Persons announced the death of Mr. Charles R. Faben, Sr., of Toledo, Ohio. The Secretary was instructed to send the following telegram of condolence to Mr. C. R. Faben, Jr.:

"C. R. Faben, Jr., Toledo, Ohio: Michigan Gas Association extends heartfelt sympathy in your family bereavement."

In due time the following response was received:

"H. H. Hyde, Secy., Michigan Gas Association, Lansing, Mich.: We beg to acknowledge receipt of your kindly worded message in behalf of the Michigan Gas Association. Assure the members present that we sincerely appreciate the sentiment kindly expressed.—C. R. Faben, Jr."

The Secretary having reported the sudden death of Mr. B. P. Holmes, President of the Ohio Gas Light Association, he was instructed to telegraph to Secretary Jones the assurance of the Michigan Association's sympathy over the Ohio Association's loss.

An adjournment was ordered to 2 P.M.

First Day, Afternoon Session.

The afternoon session was opened by the reading of the paper, by Mr. S. E. Wolff, of Jackson, Mich., on

A DESIRABLE INCREASE AND ITS SOURCE.

In presenting the following statement, the writer is aware that he presents no originality either of purpose or results, but may serve to call attention to a not novel, but somewhat neglected, means of securing an extension of the uses of gas.

The most desirable consumer is, I take it, the one who, while requiring the least expensive attention, yet with reason consumes the most gas for any purposes that to him are useful. Any plan which would increase the individual consumption of present consumers, by placing additional apparatus or otherwise, is a most desirable one, especially where gas for all purposes is sold at the same price.

On account of no expensive attention, the increase of consumption from extensive piping of old houses, or houses that have not been piped while in course of construction, is worth our attention. Our efforts for this business have been particularly directed to those using gas for cooking, but not for lighting or any other purpose. A range having been placed, no additional expense is incurred for maintenance of existing permanent investment in service, meter and meter connections; nor is any expense incurred for reading meters, collecting, stationery, or office labor; in fact, there is no increase of expense at any point, except such gratuitous care of burners and tips as is usual with most gas companies.

To the majority of the cities represented in this Association an appliance department is a necessity, and to the others a convenient agent for securing a permanent increase of consumption. How much of the increase of business of a year ago over its predecessors is due to each of the principal factors that have produced it each manager well knows. Whether he attributes more of merit to high candle power than to low price, or to excellent service than to affable employes, each has to him a known, or at least, estimated value.

The value of an appliance department may have been placed at as many high or low estimates as there have been appraisers. In the different lines of such a department none appeals more directly and constantly to those who are already consumers than a fixture and house piping department; and may I say that none has a higher value, either as an agent for getting new business or as a profit maker of itself.

For a number of years prior to the spring of 1894 our Company did nothing in the way of piping and fitting beyond the connecting of such stoves and ranges as they sold. Up to that time every plumber had kept a small stock of gas fixtures, all of which had for a long time been growing smaller and poorer, until those who desired fixtures had either to order from catalogue or to go to one of the larger, nearby cities. This continued until we constantly encountered the obstacle of expensive installation of piping and fixtures whenever we solicited a prospective customer for his residence lighting.

A small and carefully selected stock of fixtures was bought which, with the glassware, cost but a few hundred dollars. Solicitation was directed to those consumers who had ranges and stoves but did no gas lighting. This was done by personal appeal, and by placing a single light over all stoves and ranges when they were set. In houses already piped fixtures were hung, and then came to us those who desired to light with gas but had not piped their houses. This furnished something of a problem. We did not think that we wanted to go into the piping business. The piping of buildings had also been the exclusive

business of the plumbers, and when these people were told they were to go to them to have the piping done, not all went, but came again to us after a time saying that they were afraid of "The whole tribe, and didn't want to be robbed." We at first took some jobs and sublet them to the plumbers at their own prices, and after a time the plumbers formed an association and named a fixed price per foot for the work in old houses. The association's cupidity having named a prohibitive price, we decided to do the work with our own men, and while ostensibly maintaining their prices did make concessions that have greatly reduced the price to consumers, and which were so reasonable that they have been greatly appreciated by the gas consuming public. So well has it been appreciated that we have this year kept two men almost constantly at this work. These men have piped 82 houses in 10 months, and have hung chandeliers in about 130 houses.

To do this work requires a clean, careful workman, of decent habits, who can be trusted to go ahead with his job without watching. Too much care cannot be given to the selection of the men to whom this work is assigned, if a large amount of it is desired. Careful and tactful attention to the foibles of housewives will bring the gratuitous services of that best advertising medium—the discussion of daily doings, trials, etc.—which gets its best airing in the talks over the back fences of our patrons.

To convince myself this way of getting business is profitable in its results, I made a schedule of the comparative consumption of 21 consumers, selected at random, who, having bought stoves or ranges (no gas for any purpose having been previously burned) had their houses piped and fixtures hung. Of the 21 ranges, 7 were set in each of 1895, 1896 and 1897. The average monthly consumption of these 21 consumers during the time that stoves only were used was 2,040 cubic feet. The average monthly consumption after piping and fixtures were installed was 3,210 feet, being an increase of 1,170 feet; equal to 57½ per cent.

A close investigation of these figures will prove more interesting than is at first apparent. The increase in consumption per meter or consumer, amounting to a little more than 14,000 feet per year, certainly cannot cost more than a slight increase over the cost of manufacture, and the profit per 1,000 on this increase is appreciated by almost the total cost of distribution. This is equally true of any increase from present consumers, whether at first the customer burned gas for light only or for fuel only.

I trust that in the foregoing you may find what I have tried to point out, that from the source of some present business may be obtained a desirable, because profitable, increase.

A good discussion on general and special means of increasing gas sales ensued, on the conclusion of which a vote of thanks was passed to Mr. Wolff. The

QUESTION-BOX

was then put in evidence. Its contents (save the tenth number, which was debated in connection with Mr. Lynn's paper) were:

1. "Do you have trouble with the No. 197 mantle breaking at or near the top when first installed?"
2. "Do you use tile in cleaning carbon from retorts?"
3. "What is the best way of detecting a leak under a pavement?"
4. "What is the best prepayment meter?"
5. "What is the simplest way to make the average citizen understand that a 40 cent or 50 cent fuel gas is an impractical thing?"
6. "Is the pantaclinal system of main and service joints sufficiently tested to be generally adopted?"
7. "Can we establish a uniform price for tar this year without conflicting with any laws regarding trusts? If so, what is a fair price?" The debate on this question was deferred until the next meeting.
8. "What is the minimum size of works in tons of coal carbonized which can profitably utilize the ammoniacal liquor?"
9. "What is the best arrangement for preventing the formation of ice in an exposed steel gas tank?"

The debates on these questions were often lengthy and always instructive.

The Association then adjourned, to reconvene at 9:30 the following morning.

(To be Concluded.)

PRESIDENT DOUGLAS, of Eau Claire (Wis.) Gas Light Company, says that a site of 3 acres, located in the center of the city, has been purchased. An entirely new plant will be built thereon in 1900.

Some Notes on the Preserving and Fireproofing of Timber and Timber Substitutes.

By MR. S. COWPER COLES, in *Engineering*.

The rendering of wood non-inflammable has received the attention of engineers and inventors at various times since the year 1625, but it is only of late years that a practical method has been devised. To make wood absolutely fireproof, it is essential that the fire-resisting treatment should permeate the heart of the wood, so as to render it internally as well as externally fireproof. In getting rid of the combustible elements from the wood cells, and substituting the fireproofing material, great care should be exercised not to rupture their delicate structure and so deteriorate the value of the timber.

A company is now at work, both in America and England, fireproofing wood for use in the construction of war ships and for many other purposes.

A series of experiments has recently been conducted on fireproofing wood in the United States, by the Assistant Secretary of the Navy, which seems to indicate that wood preserved by the present known methods must be limited to internal fittings. It is found that fireproof wood has a tendency to slightly corrode metal fittings, is somewhat heavier and harder to work than untreated wood, does not wear well, and absorbs water. Its retention of water with the effect of alternate wetting and drying, is said to be very marked, and has been made the subject of a series of special tests. Fireproofing chemicals are found to wash out, or, in some way, to be destroyed, so that the wood becomes as combustible as ordinary timber, and, in certain ways, even more.

Works have recently been erected at Wandsworth Bridge, Fulham, and are equipped for rendering indestructible by fire large quantities of material. The wood to be treated is placed in cylinders, where, after its volatile and fermentable constituents have been given off, a fireproofing solution is applied under a pressure of 200 pounds per square inch. This operation takes about four hours. The timber is next dried in drying rooms supplied with hot air, where it remains for a fortnight or more, after which it is ready for use.

The cylinders in which the wood is placed are 7 feet in diameter and 35 feet to 75 feet long, the longest being 105 feet. The timber for treatment is stacked on small steel trucks, which are run into the cylinders.

Paynes introduced a process over 50 years ago, which consisted of inclosing the wood to be treated in a closed iron vessel, exhausting the air and allowing a solution of sulphate of iron to flow in. This at once thoroughly permeated the parts of the wood, after which a solution of muriate of lime was added, the double transference of these chemical compounds then took place, making sulphate of lime, or gypsum, and muriate of iron, the result being that the pores of the wood were filled with gypsum.

Another process has been worked out by Burnett, in which he used chloride of zinc.

Tungstate of soda has also been tried, but was found to unduly increase the weight of the wood, and to be too expensive.

Professor Pepper, after a series of careful experiments, determined that phosphate of ammonia gave excellent results.

Herr Hasselmann, of Munich, has devised a method of preserving wood sleepers, which is stated to have been used with success on the Bavarian State Railways. The object is to produce a chemical union of the substances of the wood and preservative. The process consists in the double baking of the wood, and the treatment with oil of vitriol and sulphate of iron. It is afterwards placed in a bath of chloride of lime, to which milk of lime has been added at a temperature of from 100° to 125° C., with a pressure of 40 pounds per square inch. The first baking destroys the germs of fermentation, and induces the chemical union of the preservative with the fibers of the wood. The second hardens the wood, and so changes its character. It remains hard even when left in damp places. The whole process takes about six hours, and the cost is stated to be exceedingly small.

Haskin has patented a process which comprises a chamber into which the timber to be treated is run on rails, and in which are pipes with numerous perforations for the withdrawal of air. The air is supplied from a compressor, and is heated by passing through a chamber filled with a coil conveying superheated steam. Storage reservoirs are provided to regulate the supply of air to the vulcanising chambers. The whole system is worked by a circulating pump. The object of this arrangement is to allow the gradual action of hot air on the timber, and its even distribution in the vulcanising chamber, as well as the gradual cooling of the chamber by the regulated admission of cold air into one or other of the storage reservoirs, and the subsequent circulation of the

cold air thus introduced throughout the system, in company with the remaining hot air. The chief feature of this process is to prevent the evaporation of the sap of the wood by introducing hot air into the vulcanising chamber under pressure.

Hely has proposed impregnating wood with a strong solution of calcium bisulphite, and then with a solution of caustic lime, so as to form a monosulphite, which is subsequently oxidised by the action of air to calcium sulphate, which is said to become practically part of the ligneous structure.

Another process has been patented for forcing a solution of dibasic or tetrabasic phosphate of lime and sulphurous acid into wood (from which the air has been exhausted) at a pressure of 6 to 8 atmospheres for about two hours. The wood is dried in a heated enclosed space to admit the recovery of the escaping sulphurous acid.

Messrs. Boudin and Donny conducted a number of experiments at Ghent University, but arrived at no very different conclusions. The possible diminution of strength due to all injection processes must be taken into account, and all such substances as chloride of calcium, and other deliquescent substances, must be rigorously avoided. They also found phosphate of ammonia, on the whole, to give the best results. Where injection processes cannot be employed, Messrs. Boudin and Donny recommend the application of cyanide of potassium and asbestos paint.

The following treatment of wood is alleged to render it incombustible without altering its appearance: Sulphate of zinc 55 pounds, potash 22 pounds, alum 44 pounds, oxide of manganese 22 pounds, sulphuric acid of 60° Twaddel 22 pounds, water 54 pounds, are employed. All the solids are poured into an iron boiler containing the water at a temperature of 113° F. As soon as the substances are dissolved sulphuric acid is poured in little by little until all the substances are completely saturated. The wood is boiled for three hours in this mixture and then dried in the open air. The author has experimented with zinc sulphate, but the results are not satisfactory. If the fireproofing liquid is applied at too great a pressure the cells collapse and destroy the appearance of the wood.

Issel, of Genoa, has patented a composition for rendering wood incombustible. The composition consists of a solution of stated proportions of boric acid and potash alum, and in the case of resinous woods, boric acid, oxalic acid and potassium carbonate.

Lebioda has taken out a patent for an apparatus which embodies an injector, by means of which wood can be impregnated with solutions without the necessity of boiling, which is said to ruin the texture of wood. The apparatus consists of a compressing chamber and a suction chamber, which are superposed but separated by a perforated partition.

Gunn, of Bristol, has taken out a patent for the use of cresylate of either mercury, lead, copper, iron or zinc; 100 parts of cresol are heated at a temperature between 80° and 100° C., with 120 parts of the oxide of any of the above metals, until a drop of the substance solidifies on cooling.

Incombustible paper has been made by mixing with the pulp and fluid obtained by adding to an aqueous solution 1¼ ounces of yellow tallow soap, and just enough alum to completely decompose the soap.

Artificial wood has been devised by Geig. Six to eight parts by volume of peat are washed until the fibers are saturated, and mixed with two parts of plaster of Paris and ten to twelve parts of water. The mass is moulded and subjected to hydraulic pressure and dried by means of a current of cold air. The product, when dried, may be oiled or coated with a solution of resin in alcohol. In order to prevent the rapid setting of the plaster, glue may be added together with chromate of potash, or other agglutinants may be substituted for the plaster. The composition is said to be readily worked in the same manner as wood.

Drying of Wood.—It has been estimated that green wood when cut down contains about 45 per cent. of its weight in moisture, and in the forests of Central Europe wood cut down in the winter is said to hold 40 per cent. of water until the end of the following summer. If kept in a dry place for several years wood contains 15 per cent. to 20 per cent. of water. That which has been thoroughly desiccated, when exposed under ordinary circumstances, absorbs about 5 per cent. in the first three days, and will continue to absorb it until it reaches 14 to 16 per cent. It has been found that by exposing green wood to a temperature of 212° F. the loss of weight would equal 45 per cent., and further, on exposing small prisms of wood ¼ inch square and 8 inches long, cut out of billets that had been stored for two years, to the action of superheated steam for two hours, the loss of wood was found to be from 15 to 45 per cent. according to the temperature of the steam.

The composition of wood as determined by Gay Lussac and Trenard is:

	Oak.	Beech.
Carbon.....	52.53 per cent.	51.45 per cent.
Hydrogen.....	5.69 "	5.82 "
Oxygen.....	42.78 "	42.73 "

According to Dr. Prout the oxygen and hydrogen are in exact proportions to form water.

Gas—The Hated Rival.

The *Journal of Gas Lighting* says that a very significant feature of much present-day literature of the lighting industries is the common cause made against gas by many of those whose business it is to exploit rival illuminants. Electricians do not labor to convince the public that electric lighting has advantages over lighting by mineral oil lamps, neither do the manufacturers of acetylene plant display unseemly zeal in belittling illumination by electricity. But both electrical and acetylene technicians combine to discredit gas, by fair means or foul—and if the truth be told the methods employed are at times unspeakably foul. Probably the attitude of unreasoning hate adopted by the exponents of these "lights of the future" towards illuminating gas is the outcome of a very real dread that in the ultimate struggle for survival their proteges will be worsted by their centenarian rival, whose metabolic activity still shows that growth which ceases when the prime of life is past. The vigorous mineral oil industry stands on a less firm basis than the gas industry, because the centralization of population which is proceeding gradually in every progressive country favors the economical distribution of gas, and is disadvantageous to oil. It is not, however, from the "Oil Kings" that the underhand attacks on illuminating gas emanate. The worst offenders of the present day are to be found in the ranks of the vendors of acetylene plant, whose attitude is the more incomprehensible because every rational objection to coal gas may be applied with equal or greater force to acetylene. The gas industry, indeed, is too well established and too well controlled to suffer harm from such puerile onslaughts. Yet even the inventive geniuses who have flooded the Patent Office with acetylene schemes recognize that "gas" is a name with which they may curry favor with the public; and they affix the word to acetylene with a persistency and a unanimity which are little short of marvelous. It is acetylene "gas" they propose to generate, or purify, or utilize, as though it were a "gas" produced from acetylene—even as coal gas and oil gas are produced from coal and oil—with which they were dealing. Perhaps it is merely an instance of the contagiousness of loose diction, and that by "acetylene" gas is meant "gaseous acetylene;" though it is hard to believe that the majority of the inventors ever handled, or supposed that the royalty-paying public would handle, acetylene in either the liquid or solid state. We prefer to credit those responsible for the barbarism with a laudable desire to trade on the reputation of "gas," which, in the language of ordinary life, implies common illuminating gas. Yet, if intelligence carries them so far, it is difficult to understand why they forthwith proceed to revile this same commodity.

It has been our unpleasant duty frequently to refer to the exaggerated claims made on behalf of acetylene as an illuminant. Some statements have recently been brought to our notice which are perhaps even more reprehensible than many of those circulated by stallholders at the Acetylene Exhibition at the Imperial Institute last summer. They are unfortunately being scattered broadcast through the country, in circulars issued by makers of acetylene appliances. In so far as invidious comparisons are made with coal gas, we must take leave to point out some of the most flagrant "errors"—if the euphemism be not inadmissible. A charge of 2 pounds of carbide, which yields at the most 10 cubic feet of acetylene, is said to afford for five hours approximately the same light as three "C" Welsbach incandescent burners. Now the "C" Welsbach burner gives an average light of 50-candle power; and consequently we gather from the above statement that 10 cubic feet of acetylene furnishes a light of 150 candles for five hours. In other words, the illuminating power of acetylene is made out to be 375 candles, which is about *three times* as great as its actual illuminating power in burners such as are practically available for general use.

Another of the statements in the same circular is: "Light for light, the acetylene gas is about equal in cost to coal gas at 62 cents per 1,000." Let us credit acetylene with the rather high practical illuminating power of 150 candles, or with a lighting duty of 30 candles per cubic foot. Ten cheap flat flame coal gas burners would give 150 candles for a total consumption of 50 cubic feet per hour. The consumption of acetylene under such conditions would, light for light, be one-tenth that of coal gas. If coal gas cost 62 cents, acetylene may cost $6.25 per

1,000 cubic feet, and compete with it. In order to obtain acetylene at this price, carbide must be procurable at 3 cents per pound. It is not obtainable in moderately small quantities at double this price! Let us for a moment turn the tables, and give coal gas the benefit of the duty of 30 candles per cubic foot, which the new Welsbach burner affords. Then, to be on terms of equality, acetylene must be obtainable at the same price per 1,000 cubic feet as coal gas; or carbide must be bought at 30 cents per pound, or $7 per ton. This is about one-third of the freight charges alone on carbide from Foyers to London!

Acetylene has its sphere as an illuminant; but it most certainly is not that of a competitor with coal gas, wherever the latter is obtainable at $2.50 per 1,000 cubic feet or less. The sooner the makers of acetylene generators recognize this fact, the better for their business. The public, once deceived by specious promises of performances which acetylene cannot carry out, will not forget that its confidence has been abused. But let the case for acetylene be fairly stated, and a very legitimate and permanent business in generators and carbide should result.

Dr. Frank, the well known Charlottenburg gas expert, has lately expressed the opinion that though acetylene cannot compete with coal gas or water gas as an illuminant, it should in Germany replace petroleum, if carbide is obtainable in sufficient quantity at the rate of 7½ pounds for 25 cents, and if a practicable portable acetylene lamp is made. This seems quite as sanguine a view of the prospects before acetylene in Germany as one dare take; and the scope is less in this country, where oil and gas are very much cheaper. In fact, the recent utterances of Chief Lieutenant Kries, of the German army, in an address on the German colonies, must be poor consolation for those who have put faith in the future of acetylene. The gallant officer suggested that manufacturers of carbide and of acetylene plant should turn their attention to the German colonies, of which only Kiowchow has coal deposits. The East African and other colonies have to import fuel and illuminants, and since the freight on carbide would be less than on the quantity of coal which would give an equivalent amount of illuminating gas, carbide should be able to find a market in these coal bereft regions—always provided that they have not water power handy for the production of electric light. If the districts in which acetylene can compete with coal gas are fairly represented by the colonial possessions of Germany, there does not seem much fear of a general decline in the gas industry from the severity of acetylene competition. Manufacturers of acetylene generators should spare themselves the trouble of inveighing against coal gas as a hated rival, and turn their attention to the minor fields of application of acetylene, in which it need not fear coal gas as a competitor.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE Federal Gas and Fuel Company, which was incorporated by Messrs. D. H. Kimberley, Charles O. Evarts, Lester A. Cobb, S. H. Curtis and Norman A. Gilbert, all of Cleveland, Ohio, has purchased the plant and properties of the Logan (Ohio) Gas Light and Coke Company. An ordinance permitting the new owners to distribute natural gas through the Logan Company's mains has also been secured.

THE capitalization of the Federal Gas and Fuel Company is $2,000,000, and its engineer is Mr. J. A. Mayers.

"WESTERN OBSERVER," writing from Nashville, Tenn., under date of the 3d inst., says: "The writer was most forunate to-day, and altogether accidentally, too, in sharing with the stockholders of the Nashville Gas Light Company, an appetizing luncheon that was served and enjoyed on the occasion of their annual meeting. From the menu inclosed you will see that neither quality nor quantity was slighted. The cooking was done on a gas range in the Company's office, and the tables were placed in the Directors' room. Notwithstanding a proposed raid on opposition account for Nashville, which scheme is being engineered by Messrs. Snyder and Sweetman of Kansas City opposition fame, the stockholders enjoyed the luncheon hugely. The Directors elected were: Thomas H. Malone, E. W. Cole, O. F. Noel, J. H. Fall, J. B. Richardson, J. H. Thompson and W. D. Talbot."

AT a special term of the Chancery Court, held in Columbus, Miss., the 28th ult., Chancellor Byrd presiding, it was ordered that all the property belonging to the Columbus Gas Light Company shall be sold the first Monday in April, the proceeds of the sale to be divided between the bondholders and other preferred creditors.

MR. C. E. FENNESSY, formerly connected with the New York, Rutherford and Suburban Gas Company, of Rutherford, N. J., has been elected President and Manager of the Monroe County Gas Company, of Stroudsburg, Pa.

MR. A. F. REITMEYER, Secretary and Superintendent of the Perth Amboy (N.J.) Gas Light Company, reports a gratifying increase in business, and justly reasons that the larger discount rate, 20 instead of 10 cents per 1,000 cubic feet, which goes into effect the 1st prox., will add to the Company's gains.

AT the annual meeting of the New Amsterdam Gas Company, of this city, the following Directors were elected: James Jourdan, August Belmont, Harry Keene, Chas. F. Dieterich, Jno. C. Tomlinson, John Sloane, Charles F. Cutter, Anthony N. Brady, Frank S. Hastings, Emanuel Lehman, H. B. Hollins, H. H. Rogers and W. T. Bouchelle—just 13. The only change was the substituting of William C. Lane by W. T. Bouchelle.

THE Committee on Incorporations of the Connecticut Legislature has reported favorably on the petition of the Hartford City Gas Light Company to extend its mains through the public ways of the adjacent towns of Wethersfield, West Hartford and Windsor.

MR. JOHN NICOL has been appointed Superintendent of the plant of the Pittsburgh Gas and Coke Works, Glassport, Pa., vice Mr. W. P. Parsons, resigned.

MR. J. W. THOMAS, who served the Pittston (Pa.) Gas Light Company as Superiniendent since 1883, has been superseded by Mr. Edward Flanigan. The latter's schooling for the place was acquired while serving as a station agent for the Lehigh Valley Railroad. However, he is a brother of Mr. John Flanigan, General Manager of the Gas Company of Luzerne county, Wilkes-Barre, Pa., and John is a Director in the syndicate that recently took over the Pittston gas properties.

THE Equitable Gas and Electric Company, of Utica, N. Y., has changed hands, a controlling interest in the concern having been secured by Mr. A. N. Brady and his associates. The likelihood is that Mr. E. A. Pinkney will remain in the position of General Manager.

IMPORTANT betterments will be made this season on the plant of the New Memphis Gas Light Company, of Memphis, Tenn. Main extensions will form a big entry in connection with the total cost of the proposed improvements.

HEREAFTER the gas and electric lighting interests of Healdsburg, Cal., will be managed in combination, under the title of the Merchants Gas and Electric Company. The managing man is to be Mr. Joseph Mayo.

WE are indebted to Mr. William Walton, Deputy Commissioner, Department of Buildings, Lighting and Supplies, Brooklyn, N. Y., for the following details respecting the public lighting of the named section of this city. On January 1st the numbers of lamps, with the price thereof, in use were:

Description of Lamp.	Number.	Price.
Ordinary gas lamps, not including New Utrecht ward	6,750	$17.00
" " New Utrecht ward	4,032	28.00
Welsbach lamps	720	31.50
" naphtha lamps, Prospect Park	255	30.00
Electric lights, Flatbush district	332	97.50
" " Ocean Parkway	95	116.80
" " in all other parts of borough, 1,200 c.p.	3,545	124.10
" " " " " 600 c.p.	210	62.05

The burning table is 4,000 hours per annum, and the gas prices include all charges for lighting, extinguishing, cleaning and repainting. The consumption in ordinary gas lamps is put at 3 cubic feet per hour, save in the case of the New Utrecht ward, where the rate is 4 feet. The Welsbach rate is 3 cubic feet per hour.

AT the annual meeting of the Meriden (Conn.) Gas Light Company no change was made in the personnel of the management. The reports showed a most satisfactory increase in the Company's business.

THE formal inauguration of the plant of the Jenkintown and Cheltenham Gas Company, of Wyncote, Pa., took place the afternoon of the 4th inst. The afternoon was not remarkable for atmospheric beauty and salubrity, but the damp of the day was absorbed altogether by the dryness of the spirits of those who assisted at the opening. Many of the residents of Wyncote advantaged themselves of the hospitality of

the Company, and when the hour for saying good bye was reached it was agreed all round that a fairer baptism gas company never had. Mr. Shelton and his associates have a good thing beyond a doubt in this Wyncote enterprise.

An interesting case in law was recently decided in this State. Oscar G. Rafferty and others who each owned 100 shares of the capital stock of the Buffalo City Gas Company, brought a suit in the Supreme Court, this city, against that corporation and its Directors to restrain the defendants from consummating a contemplated purchase of certain bonds and stock of the Peoples Gas Light and Coke Company of Buffalo. An order denying plaintiffs' motion to continue a preliminary injunction has been affirmed by the First Appellate Division, in an opinion by Justice Patterson, who said, among other things: "Defendants have shown in their affidavits what, apparently, is an adequate reason for making the contract based upon an actual necessity for acquiring the stocks and bonds of the Peoples Gas Light and Coke Company, and they have also shown that they cannot accomplish that object upon better terms than those submitted for the consideration of the shareholders of the Buffalo City Gas Company. The method of procedure shows honesty of purpose, was entirely open and frank, was communicated in all its details and with all its consequences to the stockholders, and is referred to them for approval or rejection. Under these circumstances the case, as was remarked by the Justice at Special Term, presents only a matter of business judgment. It cannot now be held that the price is so exorbitant as to indicate a waste of the Buffalo City Gas Company's assets, or fraud or irregularity, compelling the interference of the Court. From all that appears, the course of the Directors may be a wise method reluctantly resorted to, as they say, of saving their Company from serious disaster attendant upon a ruinous competition."

"On the 1st inst., Mr. J. A. P. Crisfield left Savannah, Ga., for Philadelphia, where, as was formerly announced in the Journal, he assumes a prominent position on the home engineering staff of the United Gas Improvement Company. An earnest of the esteem in which he is held by his former associates in the Mutual Gas Light Company of Savannah, was nicely shown by them the afternoon of Mr. Crisfield's going away. When he made his last look over the desk at which he presided so long, he found resting thereon a handsome case that covered a beautiful set of drawing instruments. The case bore a plate declaring that the box and its contents had been presented to Mr. Crisfield by the employees of the Mutual Gas Light Company. There was no formal presentation; during his absence from the office the box was placed on his desk—just that and nothing more. He takes with him to his new field of duty the heartiest wishes of everyone connected with the Mutual Company.—C."

Mr. S. J. Ward has been appointed official gas inspector for the city of Memphis, Tenn. The term of office is one year, and until a successor, named by the Mayor and confirmed by the City Council, has been designated.

Hollet Abrams has leased the works of the Cooperstown (N. Y.) Gas Company for a term of five years.

The following is the text of the original measure, introduced in the New York State Assembly by Mr. Mazet, for the purpose of authorizing the Astoria Light, Heat and Power Company, of Queens county, L. I., to supply gas and electricity conducted under and across the waters separating the boroughs of Queens, Manhattan and the Bronx, in the city of New York:

Section 1. The Astoria Light, Heat and Power Company, of Queens county, is hereby empowered to lay and maintain conductors, mains and pipes for the purpose of supplying gas and electricity in the city of New York, under and across any waters separating the boroughs of Queens, Manhattan and the Bronx, in said city, and under and across any intervening land belonging to the city of New York of the State of New York, or to private persons at such places as it may determine, and under and across any streets, avenues or public places which shall intervene between said Company's works for the manufacture of gas or electricity in the county of Queens and the East river, not exceeding 2,500 feet from said river; and to construct and maintain the subways and approaches requisite therefor; provided, however, that such conductors, mains or pipes shall be so laid and maintained as not to obstruct or impair navigation, commerce or anchorage of any navigable waters without consent of the Secretary of War, or other authorized officers of the United States. Such corporation is hereby empowered to acquire, by condemnation or purchase, such real property, public or private, or right, interest or easement therein, for the laying and maintaining of its mains, pipes and conductors as may be necessary in the exercise of the powers hereby conferred. Such property, when so acquired, shall be deemed to have been acquired and to be held as and for a public use.

Sec. 2. The said the Astoria Light, Heat and Power Company shall conform to all such general and private and local laws in regard to the laying and maintaining of electrical conductors as are applicable in the city of New York, and in the laying and maintaining of its gas pipes and mains and conductors, shall be subject to such regulations not inconsistent with the authority aforesaid, as may, from time to time, be prescribed by the municipal authortties of such city.

Sec. 3. Said corporation shall have the right to supply gas and electricity to any other company or companies engaged in supplying gas or electricity in the city of New York.

Sec. 4. For the purposes of this act, the said The Astoria Light, Heat and Power Company shall have the right, and is hereby empowered, to lease any property of any other company or companies engaged in supplying gas or electricity in the city of New York, upon such terms as shall be agreed by the Board of Directors and Trustees of the respective contracting companies, and be assented to in writing by stockholders of each of such companies holding at least two-thirds of the capital stock of their companies respectively.

Sec. 5. Nothing here contained shall authorize any increase in the price of gas now authorized to be charged in the city of New York, and nothing therein shall authorize said Company to lay gas pipes or electrical conductors under and along any streets of the city of New York, except between the Company's works in the county of Queens and the East river, without the consent of the municipal authorities of said city.

Sec. 6. All acts or parts of acts, general, private or local, inconsistent with, impairing or limiting the rights or powers conferred by this act, so far as they are inconsistent with, impair, limit or impose other or additional conditions upon the exercise of such rights or powers, are, as to the Astoria Light, Heat and Power Company, of Queens county, hereby repealed.

Sec. 7. This act shall take effect immediately.

On the night of the 7th inst., this bill was reported favorably out of the Cities Committee of the Assembly. This action would seem to presage the way out of all difficulty in reaching an amicable, and fair, settlement of the question of supplying gas in the enlarged city of New York.

The consolidation of the gas and electric industries of McKeesport, Pa., has been perfected.

Papers announcing the consolidation of the East Chester Gas Light Company, the Pelham Gas Light Company, the West Chester Gas and Electric Company, and the Larchmont Gas Company, under the title of the New York Suburban Gas Company, have been filed with the Secretary of State. The capital is put at $1,500,000, and the Directors are: Wm. Carpender, Francis Crawley, Edmund Penfold, Eugene Vanderpool and E. H. McCullough. The principal place of business is Mount Vernon, N. Y. The combination is really a merging of lighting interests hitherto separately operated by the American Gas Company.

The Market for Gas Securities.

Unevenness was the characteristic feature of the market for city gas shares last week, but the undertone was one of strength respecting Consolidated, Mutual and Standard. The progress made in the instance of putting through the Legislature the bill incorporating the Astoria Light, Heat and Power Company, which yesterday was put on the order of third reading in the Assembly, was responsible for the strength shown by Consolidated gas. During the week it sold a fraction above 221, and to-day (Friday) the price at noon was 218¼. Standard common is inquired for at 135, and 318–325 were the quoted prices for Mutual. New Amsterdam common is 38 to 38½. Unless coming events do not cast their shadows before, it is safe to believe that the war for business will not last much longer in New York.

Brooklyn Union is well above 150, and Peoples, of Chicago, at noon to-day was 115¼ to 115½. Cincinnati gas keeps climbing, sales having been made this week at 207¼. Baltimore Consolidated is fairly up to recent high quotations for it. Bay State is "active and steady," at under 5. Lacledes, of St. Louis, are lower, notably the preferred. Buffalo (N. Y.) gas securities are neglected and lower. United Gas Improvement Company is 290, and is bound to go considerably higher.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

PUBLISHED ON EACH MONDAY OF THE YEAR AT
No. 32 Pine Street, New York.

The JOURNAL is the official organ of the
NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.
AMERICAN GAS LIGHT ASSOCIATION.
WESTERN GAS ASSOCIATION.
OHIO GAS LIGHT ASSOCIATION.
PACIFIC COAST GAS ASSOCIATION.

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 Cents.

Notification Respecting Advertising.—Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

MONDAY, MARCH 13, 1899.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

March 13.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	219	219¼
Central Union, Bonds, 5's.	3,000,000	1,000	107½	108½
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	318	325
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	.
New Amsterdam Gas Co.	13,000,000	100	38	39
Preferred	10,000,000	100	69	70
Bonds, 5's	11,000,000	1,000	103¼	104
Northern Union, Bonds, 5's.	1,250,000	1,000	94½	95½
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	111	113
" 1st Con. 5's	1,500,000	..	107½	108½
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	135	138
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	152	154
" " Bonds (5's)	15 000,000	1,000	118	.
Bay State	50,000,000	50	4½	4¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	..
" 1st Mtg. 5's	450,000	1,000	..	.
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	..	80
Buffalo City Gas Co.	5,500,000	100	12	14½
" " Bonds, 5's	5,250,000	1,000	98	93¼
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	70	75
1st Mortgage	1,207,000	1,000	101	103½
Consumers, Jersey City	2,000,000	100	88	..
" Bonds	600,000	1,000	104	106
Cincinnati G. & C. Co.	8,500,000	100	206½	208
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	69	69½
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's.	1,490 000	..	..	..
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	380,000	1,000	80	82
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co.	4,560,000	50	65	65½
" Prior Lien 5's	4,546,000	1,000	94¼	94½
Detroit Gas Co., 5's	423,000	1,000	95½	96
" Inc. 5's	81,000	100	..	..
quitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	68	70
" Bonds	2,000,000	..	80	82
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	100	105
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co.	250,000	50	..	..
" 1st Mtg. 5's	250,000	1,000	..	..
Jersey City	750,000	20	210	..
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	108
Laclede, St. Louis	7,500,000	100	51½	52
Preferred	2,500,000	100	95	95½
Bonds	10,000,000	1,000	107½	108
Madison Gas & Elec. Co.	400,000	100	..	..
" 1st Mtg. 6's	350,000	1,000	..	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53½	55
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	115¼	115½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	111½	112
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	240	250
Rochester Gas & Elec. Co.	2,150,000	50	52	..
Preferred	2,150,000	50	106	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	88½	89
St. Paul Gas Light Co.	1,500,000	100	50	52
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co.	1,000,000	100	..	..
" 1st Mtg. 5's	750,000	1,000	..	..
Syracuse, N. Y.	1,750,000	100	17	18
Bonds	1,612 000	1,000	85	89
Washington, D. C	2,000,000	20	260	265
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	97	97¾
Bonds, 5's	3,880,500	.	106	108
Wilmington, Del.	550,000		208	..

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	399
Fred. Bredel, Milwaukee, Wis.	386
Geo. R. Rowland, New York City	401
The Western Gas Construction Co., Fort Wayne, Ind.	404
Humphreys & Glasgow, New York City	382
American Gas Co., Phila., Pa.	386
David Leavitt Hough, New York City	401
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	383
Baxter & Young, Detroit, Mich.	384
United Gas Improvement Co., Phila., Pa	391
James T. Lynn, Detroit, Mich.	382

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	397
United Gas Improvement Co., Phila., Pa.	391
Burdett Loomis, Hartford, Conn.	398
National Gas and Water Co., Chicago, Ills.	393
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	383
The Western Gas Construction Co., Fort Wayne, Ind.	404
Humphreys & Glasgow, New York City	382

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City	400
Continental Iron Works, Brooklyn, N. Y.	398
Deily & Fowler, Phila., Pa.	400
Kerr Murray Mfg. Co., Fort Wayne, Ind	396
Stacey Mfg. Co., Cincinnati, Ohio	399
Bartlett, Hayward & Co., Baltimore, Md.	397
Davis and Farnum Mfg. Co., Waltham, Mass.	396
R. D. Wood & Co., Phila., Pa.	398
Isbell-Porter Company, New York City	398
Fred. Bredel, Milwaukee, Wis.	386
United Gas Improvement Co., Phila., Pa.	391
National Gas and Water Co., Chicago, Ills.	393
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	383
The Western Gas Construction Co., Fort Wayne, Ind.	404
Humphreys & Glasgow, New York City	382
Gas Engineering Co., Pittsburgh, Pa.	396
American Gas Co., Phila., Pa.	386
Logan Iron Works, Brooklyn, N. Y.	400
Riter-Conley Mfg. Co., Pittsburgh, Pa.	399
Baxter & Young, Detroit, Mich.	384
Berlin Iron Bridge Co., East Berlin, Conn.	385
G. Shepard Page's Sons, New York City	401
James T. Lynn, Detroit, Mich.	382

SCRUBBERS AND CONDENSERS.

R. D. Wood & Co., Phila., Pa.	398
James R. Floyd's Sons, New York City	400
Continental Iron Works, Brooklyn, N. Y.	398
Gas Engineering Co., Pittsburgh, Pa.	396
Logan Iron Works, Brooklyn, N. Y.	400
Riter-Conley Mfg. Co., Pittsburgh, Pa.	399

TAR AND CARBONIC ACID EXTRACTOR.

R. D. Wood & Co., Phila., Pa.	398

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich.	382
Gas Engineering Co., Pittsburgh, Pa.	396

GAS METERS.

John J. Griffin & Co., Phila., Pa.	364
American Meter Co., New York and Philadelphia	408
Helme & McIlhenny, Phila., Pa.	408
D. McDonald & Co., Albany, N.Y.	401
Nathaniel Tufts Meter Co., Boston, Mass.	402
Maryland Meter and Mfg. Co., Baltimore, Md.	402
Metric Metal Co., Erie, Pa	403
Keystone Meter Co., Royersford, Pa.	402
Detroit Meter Company, Detroit, Mich.	40

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia	408
John J. Griffin & Co., Phila., Pa.	364
D. McDonald & Co., Albany, N. Y.	401
Helme & McIlhenny, Phila., Pa.	408
Nathaniel Tufts Meter Co., Boston, Mass.	402

GAS AND WATER PIPES.

M. J. Drummond & Co., New York City	401
R. D. Wood & Co., Phila., Pa.	398
Warren Foundry and Machine Co., New York City	401
Donaldson Iron Co., Emaus, Pa.	401
Utica Pipe Foundry Co., Utica, N. Y.	401

PIPE CUTTERS.

The Anderson Pipe Cutter Co., East Boston, Mass.	383

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N. Y. City	382

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y.	393

GAS COALS.

Penn Gas Coal Co., Phila., Pa.	395
Perkins & Co., New York City	394
Despard Gas Coal Co., Baltimore, Md.	395
Westmoreland Coal Co., Phila., Pa.	395
Berwind-White Coal Mining Co., New York and Phila.	394

CANNEL COALS.

Perkins & Co., New York City	394

GAS ENRICHERS.

Standard Oil Co., New York City	395
The Sun Oil Co., Pittsburgh, Pa.	395

COKE CRUSHER.

C. M. Keller, Columbus, Ind.	355

GAS GAUGES.

The Bristol Co., Waterbury, Conn.	384

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 393
Isbell-Porter Co., New York City 398
R. D. Wood & Co., Phila., Pa 398
Wm M. Crane Co., New York City 384

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N.Y 392

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J 392
B. Kreischer & Sons, New York City 392
Adam Weber, New York City 392
Laclede Firebrick Mfg. Co., St. Louis, Mo 392
Cyrus Borgner, Phila., Pa 392
James Gardner, Jr., Pittsburgh, Pa 392
Henry Maurer & Son, New York City 392
Baltimore Retort and Firebrick Co., Baltimore, Md 392
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 392
Brooklyn Firebrick Works, Brooklyn, N. Y 392

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md 397
Fred. Bredel, Milwaukee, Wis 386
J. H. Gautier & Co., Jersey City, N. J 392
Parker-Russell Mining and Mfg. Co., St. Louis, Mo 392
Adam Weber New York City 392

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City 398
Continental Iron Works, Brooklyn, N.Y 398
Logan Iron Works, Brooklyn, N. Y 400
R. D. Wood & Co., Phila., Pa 398

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa 390

MICA GOODS.

The Mica Mfg. Co., New York City 383

BURNERS.

C. A. Gefrorer, Phila., Pa 398
Wm. M. Crane Co., New York City 384
D. M. Steward Mfg. Co., Chattanooga, Tenn 384

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn 384

STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila 388
Thos. T. W. Miner, New York City 383

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 393
Greenpoint Chemical Works, Brooklyn, N.Y 393
van Baarda & Co., Dusseldorf-on-the-Rhine 398

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y 384
Chapman Valve Manufacturing Co., Boston, Mass 384
R. D. Wood & Co., Phila., Pa 398
Continental Iron Works, Brooklyn, N. Y 398
The P. H. & F. M. Roots Co., Connersville, Ind 387
Isbell-Porter Co., New York City 398
The Western Gas Construction Co., Fort Wayne Ind 404

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind 387
Isbell-Porter Company, New York City 398
Connelly Iron Sponge and Governor Co. New York City 393

ELECTRICAL APPARATUS.

Wm. Henry White, New York City 390

GAS ENGINES.

Backus Water Motor Co., Newark, N. J 392

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City 383

PURIFIER SCREENS.

John Cabot, New York City 384

GAS STOVES.

American Meter Co., New York and Philadelphia 389
Maryland Meter and Manufacturing Co., Baltimore, Md. 402
Keystone Meter Co., Royersford, Pa 402
Wm. M. Crane Co., New York City 384
Detroit Stove Works, Detroit, Mich 348
George M. Clark & Co., Chicago, Ills 398

GASHOLDER TANKS.

J P. Whittier, Brooklyn, N. Y 384

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md 397
Continental Iron Works, Brooklyn, N. Y 398
Deily & Fowler, Philadelphia, Pa 400
Davis & Farnum Mfg. Co., Waltham, Mass 396
Kerr Murray Mfg. Co., Fort Wayne, Ind 396
Stacey Mfg. Co., Cincinnati, Ohio 399
R. D. Wood & Co., Philadelphia, Pa 398
Logan Iron Works, Brooklyn, N. Y 400
Riter-Conley Mfg. Co., Pittsburgh, Pa 399

Position Wanted.

On account of changes made in my present Company, I will sever my connection therewith on February 20, and solicit correspondence with Gas Companies contemplating a change of management. Eight years with present Company. References. E. G. HOLZER, Supt. Gas Dept.,
1233-tf Roanake Gas and Water Co., Roanoke, Va.

SECOND-HAND APPARATUS.

I am in position to offer at attractive prices, a considerable quantity of good, usable second-hand Gas Apparatus, of various kinds and sizes, such as Purifiers, Station Meters, Exhausters, Scrubbers and Condensers, Bench Ironwork, Water Gas Machinery, Tanks, etc., etc. Gas Companies or Contractors who can use such will find it worth while to write for prices, stating their requirements. Gas Companies having apparatus to dispose of are invited to communicate upon the matter. F. H. SHELTON,
Drexel Building, Phila.

FOR SALE,

At Receiver's Sale,

One Gas Plant, Electric Light and Street Railway Plant.

A splendid opportunity for investors. For full particulars address W. R. FABEN, Receiver,
1240-tf Defiance, Ohio.

FOR SALE.

A Second-Hand Set of Four Purifying Boxes, including dry Center-Seal—12-inch Connections, and **Two Hoisting Carriages.** Boxes are 12 feet by 18 feet by 3 feet 6 inches deep; are in good condition, and only sold because have been replaced by larger Boxes, and will be sold at a low price.

For terms, etc., address
PORTLAND GAS LIGHT CO.,
1238-tf Portland, Me.

For Sale.

A Small Gas and Electric Light Plant, in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,
1097-tf Fort Wayne, Ind.

Utilize Your Gas Liquor.
NO EXTRA LABOR OR OPERATING EXPENSES.
Ammonia Concentrator,
Not Expensive. Write to
STROH & OSIUS, Pat'ees, or
Mich. Ammonia Works, Detroit, Mich.

JAMES T. LYNN,

GAS ENGINEER
AND
CONTRACTOR,
Wayne Bank Building, - DETROIT.
GAS PROPERTIES PURCHASED.

Bray's Patent Gas Burners

Are universally used and recommended by leading Gas Companies of the world.
Every Burner stamped with name and Trade Mark. Take no imitations.
Made for high and low pressure. Send for description and prices, also for

ACETYLENE BURNERS.

We are Sole Agents for the United States.

With Bray Burner.

WILLIAM M. CRANE COMPANY,
Nos. 1131 and 1133 Broadway, New York City.

ALEX. C. HUMPHREYS, M. E., M. Inst. C. E. ARTHUR G. GLASGOW, M. E., M. Inst. C. E.

HUMPHREYS & GLASGOW,

BANK OF COMMERCE BLDG.,
31 Nassau Street,
New York.

9 VICTORIA STREET,
London, S. W.,
England.

CONSULTING GAS ENGINEERS
AND MANAGERS.
GAS PROPERTIES PURCHASED.

GOODMAN

GAS MAIN STOPPER

For Shutting Off Gas in Mains Temporarily during Alterations or Repairs.
For Particulars Address

SAFETY GAS MAIN STOPPER COMPANY,
211 East 116th Street, New York.

W. H. PEARSON, Prest. W. H. PEARSON, Jr., Vice-Prest. J. T. WESTCOTT, M.E., Manager. L. L. MERRIFIELD, M.Inst.M.E., Chief Engineer.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION CO., LD.

American Offices: 269 FRONT STREET, EAST, TORONTO, ONT.
London Offices: 19 ABINGDON STREET, WESTMINSTER, S.W.

Telegraphic Address: "CARBURETED LONDON AND TORONTO."

The above Company have erected since 1893, or are now erecting, their universal type of Carbureted Water Gas Plants at the following Gas Works:

	Cubic Feet Daily.
Blackburn, Eng.	1,250,000
Windsor Street Works, Birmingham, Eng.	2,000,000
Saltley Works, Birmingham, Eng.	2,000,000
Colchester, Eng.	300,000
Birkenhead, Eng.	2,250,000
Swindon (New Swindon Gas Co.), Eng.	120,000
Saltley Works, Birmingham, Eng. (2d Contract)	2,000,000
Windsor Street Works, Birmingham, Eng. (Second Contract),	2,000,000
Halifax, Eng.	1,000,000
Toronto,	250,000
Ottawa,	250,000
Toronto (Second Contract, Remodeled),	2,000,000
Lindsay (Remodeled),	125,000
Belleville,	250,000
Ottawa (Second Contract),	250,000
Brantford (Remodeled)	200,000
St. Catherine's (Remodeled),	250,000
Kingston, Pa.	125,000
Montreal,	500,000
Peterborough, Ont.	250,000
Wilkesbarre, Pa.	750,000
St. Catherine's (Second Contract),	250,000
Buffalo, N. Y.	2,000,000
Winnipeg, Man.	500,000
Colchester, Eng. (Second Contract),	300,000
York, Eng.	750,000
Rochester, Eng.	500,000
Kingston, Ont.	300,000
Crystal Palace District, Eng.	2,000,000
Duluth, Minn.	300,000
Caterham, Eng.	150,000

"THE MINER"

Globe Street and Boulevard Lamps.

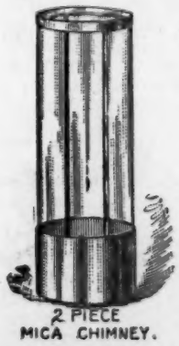
Cheapest and Best.

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

Send for Catalogues.

THOMAS T. W. MINER,
821-823 Eagle Av., N. Y.

Our Mica Chimneys

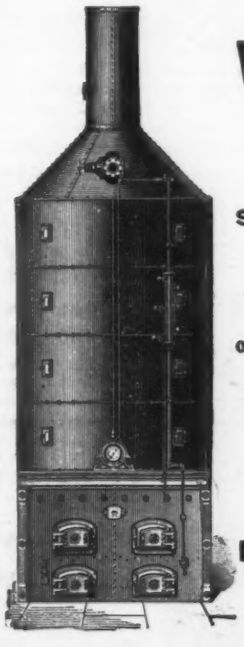


Etched Chimneys to Order.

For Welsbach Lights ARE THE BEST IN THE WORLD.

Get Catalog and Discounts.

The MICA MFG. CO.
Micasmiths,
88 Fulton Street,
N. Y. City.



HIGH-PRESSURE
WATER-TUBE BOILERS.

THE HAZELTON OR PORCUPINE BOILER
IN 50 to 500 H. P. UNITS.

SINGLE BOILERS OR COMPACT BATTERIES.
GREAT SAVING OF FLOOR SPACE AND FUEL.

LARGE-SIZE BOILERS IN STOCK.

Our new book, "The Generation of Power," will be mailed on request.

THE HAZELTON BOILER CO.
Sole Proprietors and Manufacturers.
ALSO BUILDERS OF
Stacks, Tanks and Miscellaneous Metal Work.
GENERAL OFFICE:
No. 716 E. 13th ST., New York, U.S.A.

Cable Address, "Paila," New York.
Telephone Call, 1229-18th Street, New York.

THE ANDERSON Patent Cutter Carrying Link
Made in all sizes.

Will cut from 2 in. to 24 in.
Pipe Cutting Tool

For Cutting Cast, Wrought Iron, Gas & Water Pipes.

THE ANDERSON PIPE CUTTER COMPANY, Manufacturers,
163 Liverpool st., E. Boston, Mass
N. Y. Office, 135 Greenwich St
C. H. TUCKER, JR., Manager.
WALDO BROS.,
102 Milk Street, Boston, Mass.

GAS APPLIANCES FOR EVERY PURPOSE.

GAS RANGES,
GAS SOLDERING STOVES,
GAS STEAM TABLES,
GAS CREMATORIES,
BRAY BURNERS,
GAS BURNERS,
GAS SIGNS,
SELF-LIGHTING BURNERS,
BY-PASSES,
GAS FITTINGS,
METER COCKS,
SERVICE COCKS,
WAX TAPERS,
GOOSE NECKS,
SOCKETS,
TUBING, ETC.,
GRAY IRON CASTINGS.

GAS WATER HEATERS,
GAS KILNS,
GAS LAUNDRY STOVES,
GAS OVENS,
GAS PLATE WARMERS,
GAS OYSTER STEWERS,
GAS CONTROLLERS,
GAS BROILERS,
GAS HEATING STOVES,
GAS FIRES,
GAS RADIATORS,
GAS LOGS,
GAS CANDY STOVES,
GAS GRIDDLES,
GAS FURNACES,
GAS IRONS,
GAS TIPS,

THE NEW VULCAN GAS RANGE.

Sizes, 16 and 18-inch Ovens.

WILLIAM M. CRANE COMPANY,

FOUNDRY: Peekskill, N.Y. Office and Showrooms: 1131 and 1133 Broadway. FACTORY: 447-453 W. 14th St.

Send for 1899 Catalogue. Sole Agents for BRAY BURNERS for U. S. A.

COLD FACTS, EASILY DEMONSTRATED.

The Steward Burner

IS THE BEST UNION JET SPECIAL BURNER ON EARTH.

AMERICAN BRASS,
AMERICAN LAVA,
AMERICAN LABOR,

are the best in the world, and are all used in the Steward Burner. Therefore, according to axiom six, "Things made from the best things in the best manner are best themselves."

The STEWARD BURNER is the Best on Earth! Q. E. D.

The D. M. Steward Mfg. Co.,

CHATTANOOGA, TENN.

New York Office, 107 Chambers Street.

BAXTER & YOUNG,

CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid.

CORRESPONDENCE SOLICITED.

OFFICE: WAYNE COUNTY BANK BUILDING, Rooms 201 & 202. DETROIT, MICH.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

70 Rush St., Near Division Ave., Brooklyn, N. Y.

Special Trays for Iron Sponge or Oxide of Iron,

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired.

553-557 West Thirty-third Street, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

Send for Circulars.

Bristol's Recording

PRESSURE GAUGE.

For continuous records of Street Gas Pressure. Simple in construction, accurate in operation, and low in price.

Fully Guaranteed. Send for Circulars.

THE BRISTOL CO.,

Waterbury, Conn.

CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.

THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72",

—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

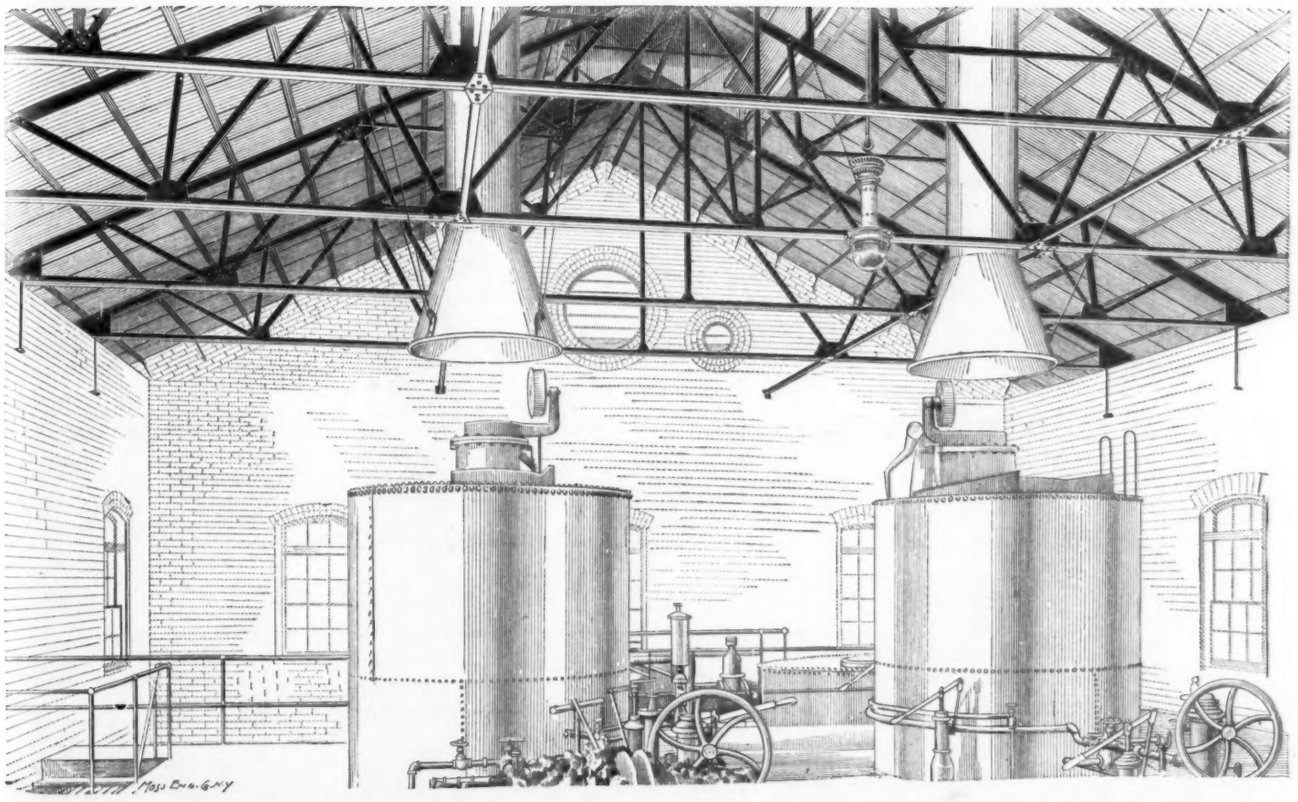
HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

CHARLES M. JARVIS, President. GEORGE H. SAGE, Secretary. F. L. WILCOX, Treasurer.

THE BERLIN IRON BRIDGE CO.

Engineers, Architects and Builders of Steel Structures.



The above illustration is taken direct from a photograph, and shows the construction of an Iron Truss Roof designed and built by us for the Providence Gas Company, at Providence, R. I. The building is 40 feet in width by 100 feet in length, the roof being entirely of iron—that is, iron trusses, iron purlins, and covered with corrugated iron, thus making it absolutely fireproof, no woodwork being used about the construction. The ridge is covered with one of our improved ventilators, extending the full length, with side shutters opening and closing from the floor. This roof was built by us several years ago, and we have lately received from the same Company a contract for several other large buildings in the extensions which they are about to make.

BOSTON OFFICE, 200 Equitable Building.
NEW YORK OFFICE, 718 Bennet Building, Cor. Fulton and Nassau Streets.
PHILADELPHIA OFFICE, 1215 Stephen Girard Building.

Main Office and Works, EAST BERLIN, CONN.

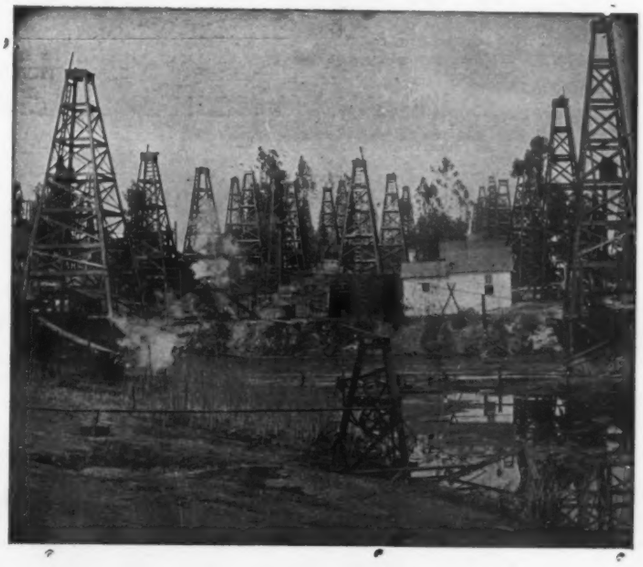
Gas Investments in California.

Nowhere else on this continent does such opportunity exist for profitable gas investment as on the Pacific Coast, since the perfection of the new LOWE Process for using the heavy crude California oils (of which there is an unlimited supply) without the use of any other fuels. Seven years' test proves the system to be perfect in every respect. Los Angeles alone, in addition to present street mains, has 150 miles of well built up streets without a gas main on them. To occupy this territory, and a large number of other towns now without gas, we have organized a parent company and a number of local companies covering some of the fastest growing cities in the United States.

Now is the time to invest, when the first capital will be able to double itself in a single year. This is also the most delightful residence section in the United States.

We suggest to those desiring gas investments, in large or moderate amounts—with or without active business connections—to come here and investigate; or, what is the next best thing, write us for particulars and prospectus.

The accompanying cut shows the oil wells in the suburbs of Los Angeles from which the Companies under the NEW LOWE GAS PROCESS obtain their supply of oil.



AMERICAN GAS & COKE CO. (T. S. C. Lowe, Manager),
406 Bradbury Building, Los Angeles, California.

AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

KLONNE-BREDEL

Recuperative Furnaces, Washers, Condensers, Purifiers and Purifying Machines, Ammonia Plant, Coke Conveyers, Etc.

Complete Works Erected with Guaranteed Results.

EASTERN AGENTS FOR

FRED. BREDEL'S SYSTEM
COAL GAS PLANTS AND GAS APPARATUS.

P. H. & F. M. ROOTS CO.'S
Exhausters, Blowers, etc.

222 South Third Street, Philadelphia, Pa.

GEORGE G. RAMSDELL, General Manager. **Correspondence Solicited**

FRED. BREDEL, C.E.

Coal and Water Gas Plants.

OWN SYSTEM.

RECUPERATIVE FURNACES, WASHERS, CONDENSERS, PURIFIERS, PURIFYING MACHINES, COKE CONVEYERS, ETC.

SOLE UNITED STATES AGENT FOR
ARROL-FOULIS MECHANICAL CHARGING AND DRAWING MACHINES.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas.

GAS RETORTS AND SPECIAL BLOCKS AND FIREBRICK MANUFACTURED UNDER THE SUPERINTENDENCE OF MY OWN CHEMIST.

COMPLETE GAS WORKS

No. 118 Farwell Avenue, · Milwaukee, Wis.

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa

ROOTS'

LATEST IMPROVED GAS EXHAUSTER

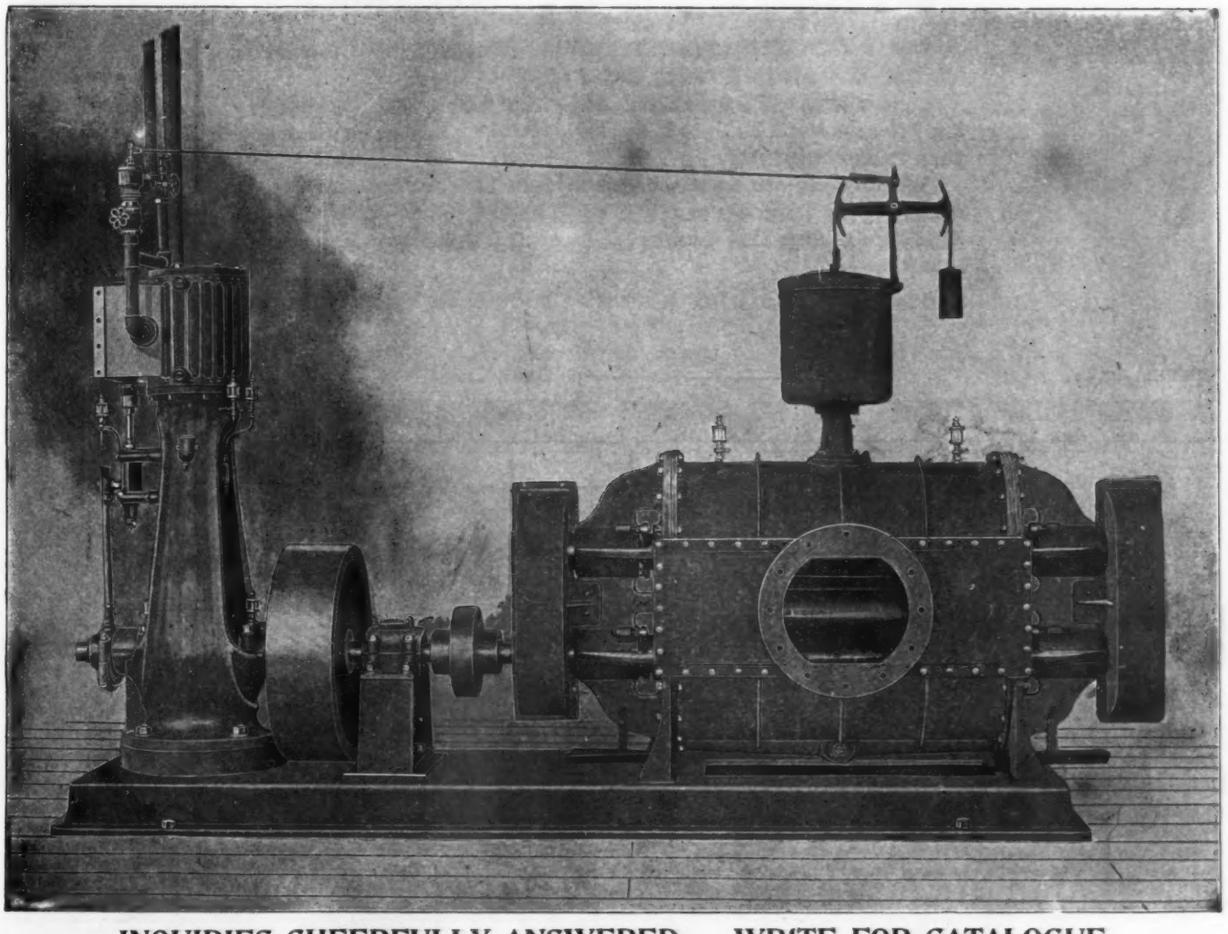
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

P. H. & F. M. ROOTS CO.,

Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

American Gas Company,

222 South Third Street, Philadelphia, Pa.

NEW YORK, 33 NASSAU ST. PHILADELPHIA, 1932 MARKET ST. CHICAGO, 54 LAKE ST.

WELSBACH STREET LIGHTING COMPANY OF AMERICA,

—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

STYLE No. 81.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

Lists of Cities and Towns in which we are now lighting under contract will be furnished upon application.

STYLE No. 97.

CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

NOW READY.

THE SIXTH (AND CENTENARY) EDITION
— OF THE —

Handbook for Gas Engineers and Managers.

By THOMAS NEWBIGGING, M. Inst. C.E.

This Edition of the "Handbook for Gas Engineers and Managers" is a great improvement on all previous editions Much of the text has been re-written, in order to keep the work abreast of the constant advances that are being made in the Gas Industry.

PRICE, - - $6.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, N. Y. City.

PRACTICAL HANDBOOK ON

GAS ENGINES

With Instructions for Care and Working of the Same.

By G. LIECKFELD, C.E.

Translated with Permission of the author by GEO. M. RICHMOND, M.E.

Price, $1.00.

A. M. CALLENDER & CO., 32 Pine Street, New York.

(Copyrighted, 1894, by the AMERICAN METER CO.

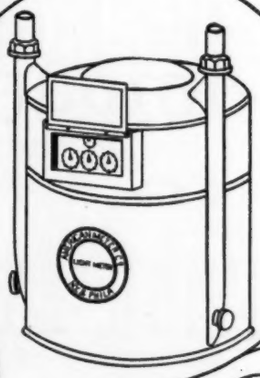
AMERICAN METER CO.

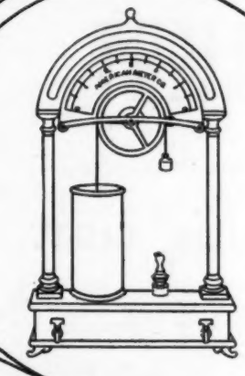
ESTABLISHED 1834. INCORPORATED 1863.

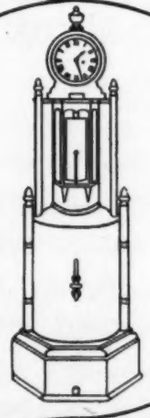
NEW YORK AND PHILADELPHIA,

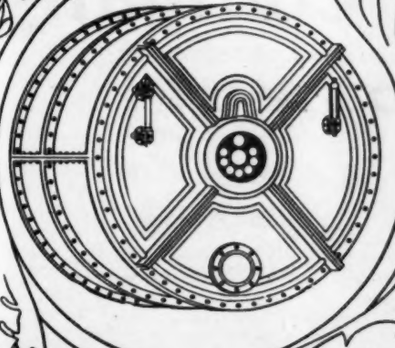
CHICAGO, ST. LOUIS,

SAN FRANCISCO.









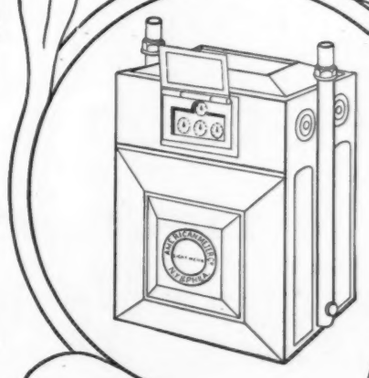
PUBLIC LIGHTING TABLE.

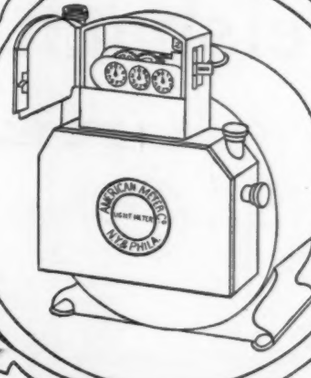
MARCH, 1899.

Day of Week.	Table No. 1. Following the Moon. Date.	Light.	Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Extinguish.
				P.M.	A.M.
Wed.	1	6.20 PM	11.20 PM	5.30	5.45
Thu.	2	6.20	12.30 AM	5.30	5.45
Fri.	3	6.20	1.30	5.30	5.45
Sat.	4	6.20 LQ	2.40	5.30	5.45
Sun.	5	6.30	3.30	5.40	5.35
Mon.	6	6.30	4.20	5.40	5.35
Tue.	7	6.30	5.10	5.40	5.35
Wed.	8	6.30	5.20	5.40	5.35
Thu.	9	6.30	5.20	5.40	5.35
Fri.	10	6.30	5.20	5.40	5.35
Sat.	11	6.30 NM	5.20	5.40	5.35
Sun.	12	6.40	5.10	5.50	5.20
Mon.	13	6.40	5.10	5.50	5.20
Tue.	14	6.40	5.10	5.50	5.20
Wed.	15	6.40	5.10	5.50	5.20
Thu.	16	11.00	5.10	5.50	5.20
Fri.	17	11.50	5.10	5.50	5.20
Sat.	18	12.40 AM	5.10	5.50	5.20
Sun.	19	1.20	5.00	6.00	5.10
Mon.	20	2.00	5.00	6.00	5.10
Tue.	21	2.30	5.00	6.00	5.10
Wed.	22	3.00	5.00	6.00	5.10
Thu.	23	3.20	5.00	6.00	5.10
Fri.	24	3.50	5.00	6.00	5.10
Sat.	25	No L.	No L.	6.00	5.10
Sun.	26	No L. FM	No L.	6.10	4.55
Mon.	27	No L.	No L.	6.10	4.55
Tue.	28	6.50 PM	9.10 PM	6.10	4.55
Wed.	29	6.50	10.20	6.10	4.55
Thu.	30	6.50	11.30	6.10	4.55
Fri.	31	6.50	12.30 AM	6.10	4.55

TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166.50	April	298.50
May	158.00	May	264.50
June	140.50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45





Welsbach Commercial Company,

DREXEL BUILDING,

PHILADELPHIA.

WE NOW SELL

THE IMPROVED WELSBACH LIGHT

to all gas companies and first-class dealers in gas appliances.

SEND FOR NEW CATALOGUE AND PRICE LIST.

We are now prepared to furnish our New Combination Pilot Jet By-Pass and Adjustable Bunsen.

Our New Hot Wire Electric Igniter is a great improvement in electric gas lighting. Cannot short circuit. Send for prices and full information.

All imitations of the Welsbach light are infringements of the Welsbach patents, and the public is cautioned against purchasing such.

Suits brought by the Welsbach Light Company against manufacturers of infringing lights and mantles are still pending and undetermined.

Every genuine Welsbach lamp has the trade-mark, "Welsbach," conspicuously printed on the package and on the burner itself.

Welsbach Commercial Company,

DREXEL BUILDING,

PHILADELPHIA.

Standard Lowe Water Gas Apparatus

Constructed During 1898

BY

THE UNITED GAS IMPROVEMENT COMPANY

Philadelphia.

PLACE.	SETS OF APPARATUS.	DIAMETER OF SHELLS.	
Cleveland, O.	3	8 ft. 6 in.	
Portland, Me.	1	7 ft. 6 in.	
Washington, D. C.	4	8 ft. 6 in.	
Philadelphia, Pa.	20	8 ft. 6 in.	
Norfolk, Va.	1	7 ft. 6 in.	(Second Contract.)
Trenton, N. J.	2	7 ft. 6 in.	
Flint, Mich.	1	4 ft.	
Jenkintown, Pa.	1	5 ft.	
Yonkers, N. Y.	1	8 ft. 6 in.	
Paterson, N. J.	1	8 ft. 6 in.	
Waterbury, Conn.	1	8 ft. 6 in.	
Chicago (Ogden Gas Co.)	1	8 ft. 6 in.	(Second Contract.)
LaFayette, Ind.	1	5 ft.	(Second Contract.)
Lynn, Mass.	1	7 ft. 6 in.	(Second Contract.)
Mt. Clemens, Mich.	1	4 ft.	
New Brunswick, N. J.	1	6 ft.	
Pittsfield, Mass.	1	5 ft.	(Second Contract.)
New York (East River Co.)	2	11 ft.	(Second Contract.)
Johnstown, N. Y.	2	6 ft.	
Waukegan, Ill.	1	5 ft.	
Chester, Pa.	1	6 ft.	(Second Contract.)
Somerville, N. J.	1	4 ft.	
Hackensack, N. J.	1	6 ft.	(Second Contract.)
Torrington, Conn.	2	5 ft.	
Glassport, Pa.	2	5 ft.	

Established 1858. Incorporated 1890.

CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St. Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of { GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

ESTABLISHED IN 1845.

B. KREISCHER & SONS,

Office, 119 E. 23d St., New York.

Gas Retorts,

TILES, FIRE BRICK.

AND EVERYTHING IN THE FIRE CLAY LINE.

Adam Weber,

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Hamilton Building, Fifth Avenue
PITTSBURGH, PA. P. O. Box 373

Successor to WILLIAM GARDNER & SON

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

PRICE LIST.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD & CO.,

N. 3d & Prospect Avs., Mt. Vernon, N.Y.

Western Agent, H. T. GEROULD, Centralia, Ills.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec'y
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tile

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 10x10x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS.

Sole Agents for New England States.

PRACTICAL PHOTOMETRY.

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations. Price, $3.00 A. M. CALLENDER & CO., 32 Pine Street, N. Y. City

National Gas and Water Company.

CONTRACTORS FOR
Gas Plant Machinery

SOFT COAL OR COKE
WATER GAS GENERATORS
A SPECIALTY.

218 LA SALLE ST.,
CHICAGO.

Gas Engineers
INSPECTION AND ADVICE.

PLANS AND ESTIMATES
FOR IMPROVEMENTS OR
REPAIRS.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)
MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR.
OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT!
WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION!
REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE!
IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.

Hughes' "Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by
WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

IRON MASS
For Gas Purification.
Acts immediately, and more efficiently than any other purifying agent now in use.
GREENPOINT CHEMICAL WORKS,
Greenpoint Ave. and Newtown Creek, Brooklyn, N. Y.

The Chemistry of Illuminating Gas.
By NORTON H. HUMPHRYS. Price, $2.40.
A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY.

Cyanogen.
A PURIFYING MATERIAL FOR GAS.
Soft and porous, it can be used in the natural state without any preparation, and it ensures perfect purification.
SPECIMENS AND PRICES ON APPLICATION.

VAN BAARDA & CO.,
MINE OWNERS,
DUSSELDORF-ON-THE-RHINE.

Parson's Steam Blower,
FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREZEE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,
FOR USING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,
FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON, Supt., 67 Bremen Street, Brooklyn, N. Y.

JAMES D. PERKINS, President. F. SEAVERNS, Treasurer.

THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,
Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

SCIENTIFIC BOOKS.

NEWBIGGING'S HANDBOOK. By Thos. Newbigging. 6th edition. $6.

COX'S GAS FLOW COMPUTER. $2.50.

HUGHES' GAS WORKS. $1.65.

POOLE ON FUELS. By Herman Poole. $3.

GAS ENGINEER'S POCKET-BOOK. By Henry O'Connor. $3.50.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards. 20 cents.

CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.

RACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

GAS WORKS: Their Arrangement, Construction, Plant and Machinery. $5.

RACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

HE GAS WORKS OF LONDON. By Colburn. 60 cents.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

GASFITTER'S GUIDE, by John Eldridge 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2

CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.

DIGEST OF GAS CASES. $5.

PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR. By Geo. Lunge. New edition. $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT: A Manual of Lime and Cement, their Treatment and Use in Construction. By A. H. Heath. $2.50.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Kapp. $3.50.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

MAGNETISM AND ELECTRICITY. By J. Overend. 40 cts

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATED WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order. No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point Baltimore, Md.
OFFICE, - 640 Equitable Building Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } *AGENTS,* { BANGS & HORTON 60 Congress St., Boston.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

Do You Wish to Know

what size of pipe to use to convey any quantity of gas, any distance, with any loss of pressure and any initial or final pressure? Then use

Cox's Gas Flow Computer,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 6.5 x 8 inches, in cloth case, $2.50. For sale by

A. M. Callender & Co., 32 Pine St., N. Y.

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened and Prepared for Gas Purposes.

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

Room 720, Reading Terminal Building, Phila., Pa.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River: Pier No 1 (Lower Side), South Amboy, N. J.

EDMUND H. McCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J., WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

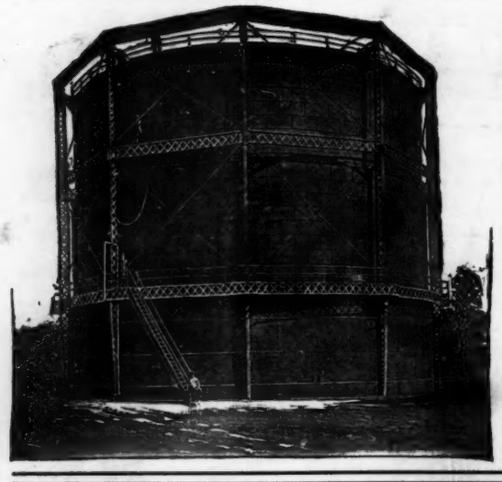
GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.



DAVIS & FARNUM MFG. CO.,

WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, R'm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

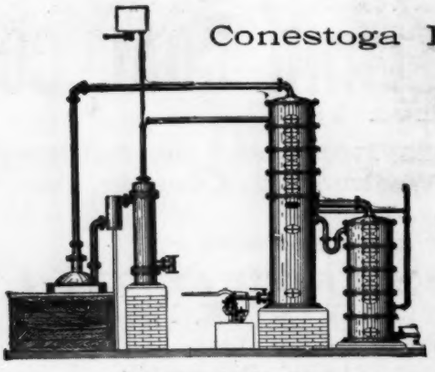
Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

GAS ENGINEERING COMPANY.

INCORPORATED,

Conestoga Building, PITTSBURGH, PA.



AMMONIA MACHINE.

MANUFACTURERS OF

Gas Works Machinery of all kinds,

PATENTEES AND OWNERS OF

PITTSBURGH WASHER-SCRUBBER,

SOLE AGENTS FOR

FELDMANN AMMONIA MACHINE,

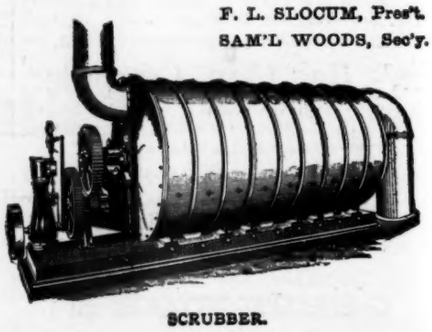
For producing Sulphate, Aqua, Chloride and Concentrated Liquors.

The Erection of Bi-Product Coke Ovens a Specialty.

Faux System of Recuperative Benches.

NEW SYSTEM HYDRAULICS.

F. L. SLOCUM, Pres't.
SAM'L WOODS, Sec'y.



SCRUBBER.

Kerr Murray Manufacturing Company,

Steel Gasholder Tanks,

SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,

HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.

Address,

KERR MURRAY MANUFACTURING CO.

Fort Wayne, Indiana.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

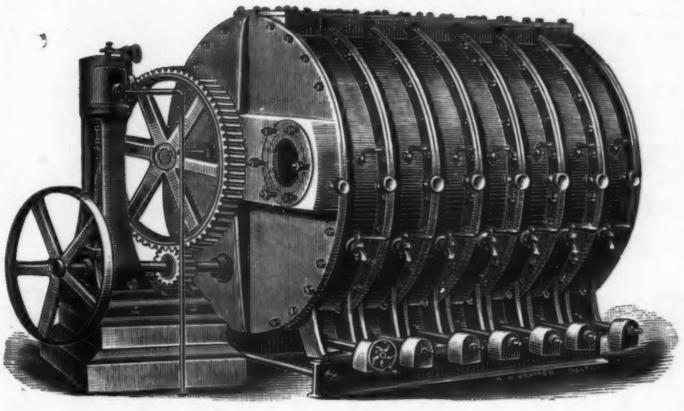
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSIBLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

EXCERPTS FROM DECISIONS

—OF THE—

BOARD OF GAS COMMISSIONERS of the COMMONWEALTH OF MASSACHUSETTS.

MR. E. H. YORKE, NEW HAVEN, CONN., Dec. 1, 1898.

Dear Sir:—I am in receipt of a copy of "Excerpts from the Decisions of the Board of Gas Commissioners," which is a handy compilation in book form of extracts from the most recent decisions of the Gas Commission of Massachusetts.

I note that most of these extracts are broad and safe-guiding precepts, which apply with equal force to one Company as to another. The 13 years' existence of the Board of Gas Commissioners with its unusual opportunities for acquiring information, have justly made it a high and safe authority in all matters pertaining to the management, obligations, and rights of Gas Companies. Your little book will serve as a valuable reference library in settling legal complications which often arise between a Gas Company and its customers.

Yours truly, (Signed) F. C. SHERMAN, Superintendent.

A 28-page Pamphlet containing the cream of this Board's decisions as to the proper management of Gas Companies.

Compiled by E. H. YORKE. Price $1.00. Address

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.

Foundries and Works: { Millville, N. J. / Florence, " / Camden, "

R. D. WOOD & CO.

ENGINEERS, IRON FOUNDERS, MACHINISTS

400 Chestnut Street, PHILADELPHIA, PA.

MANUFACTURERS OF

CAST IRON PIPE

SOLE MAKERS OF

THE MITCHELL SCRUBBER

(PATENTED)

PURIFIERS, CONDENSERS, SCRUBBERS.

THE HOPPER AUTOMATIC GAS GOVERNOR.
BENCH WORK. PLATE GIRDERS.
IRON FLOORS AND ROOFS.

BUILDERS OF

GAS HOLDERS

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks.

PEASE'S PATENT WIRE ROPE GUIDING FOR GAS HOLDERS.

CUTLER'S
PATENT FREEZING PREVENTER
FOR GAS HOLDER CUPS.

THE TAYLOR REVOLVING BOTTOM GAS PRODUCER,
HEAVY LOAM CASTINGS, DUNHAM SPECIALS, HYDRAULIC WORK,
LAMP POSTS, VALVES, ETC.

ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

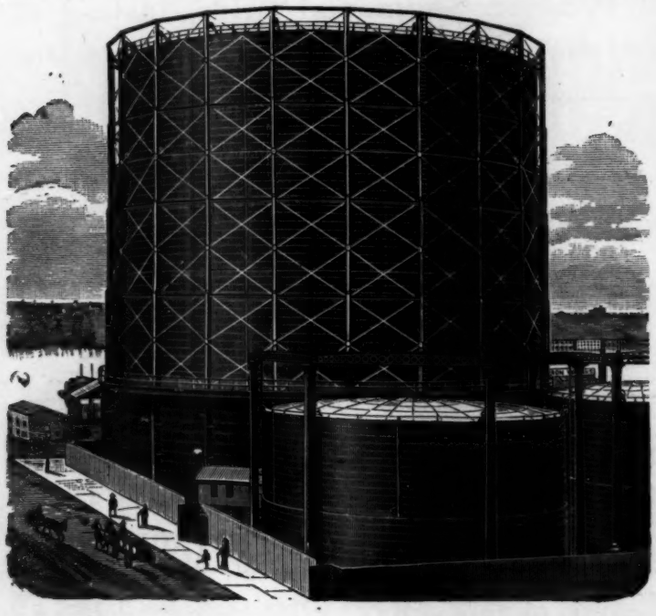
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. OFFICES Bridge & Ogden Sts., Newark, N. J.



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, Jr., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

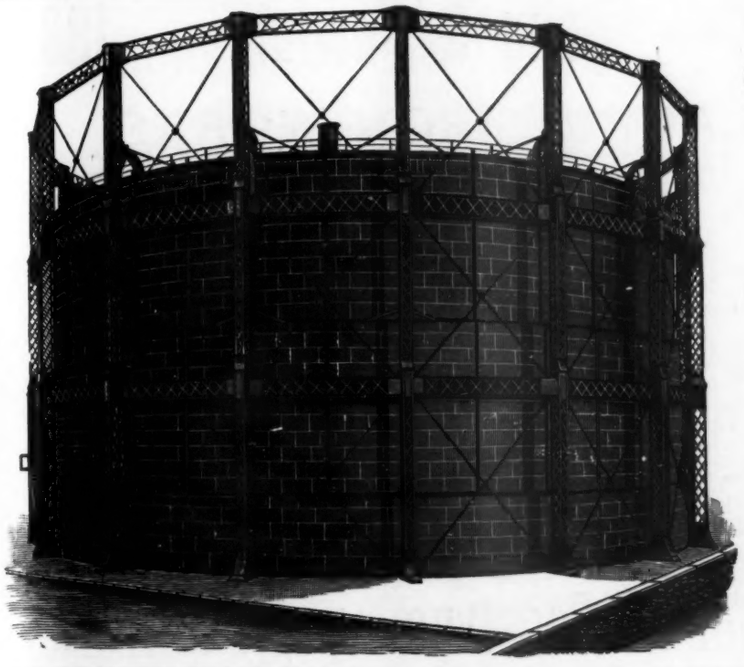
BURDETT LOOMIS, - - Hartford, Conn.

To Gas Companies.

We make to order CAP BURNERS to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
248 N. 8th St., Phila., Pa.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO

Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.

RITER-CONLEY MFG. CO.,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

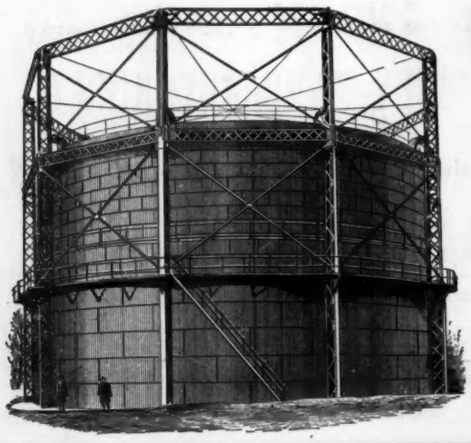
Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited. Plans and Estimates Furnished.

1899 DIRECTORY 1899

OF AMERICAN GAS COMPANIES

Price, - - - - - - - - - $5.00.

A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.



1842 ⁂ Deily & Fowler, ⁂ 1899

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

JAMES R. FLOYD'S SONS,

Successors to HERRING & FLOYD,

Oregon Iron Works,

West 20th and 21st Streets, Between 10th & 11th Avenues, New York City.

Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF ALL KINDS OF CASTINGS AND GENERAL IRONWORK FOR GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings, Condensers, Tower Scrubbers, Mechanical Scrubbers, Purifiers, Malleable Iron Retort Lids, Self-Sealing Retort Lids, Hydraulic Hoist Purifier Carriage, Crosses, Tees, Bends, Angles, Reducers, S-Bends, Sectional Sleeves, Plugs, Caps, Street Drips, etc., always on hand.

WOOD'S GAS SCRUBBING AND ENRICHING APPARATUS.

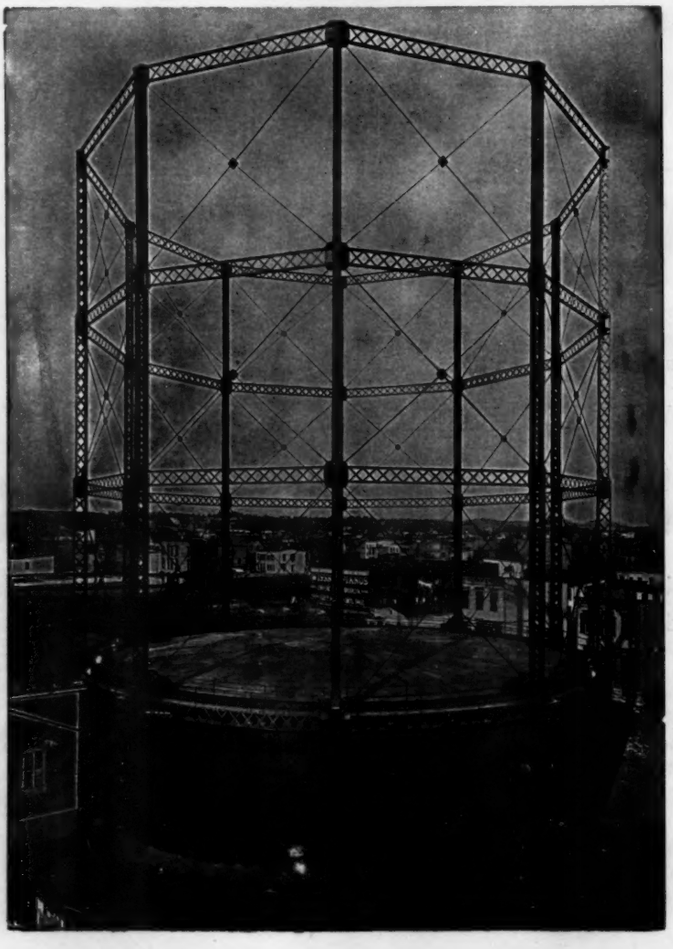
In use at Syracuse, Auburn, Watertown, Cortland and Geneva, N.Y.; Elizabeth, N. J.; Boston, Mass.; Jamaica Plain, Mass.; Providence, R. I.; Northern Liberties Gas Co., Phila.

Sole Manufacturers of the OGDEN QUICK-MOVING VALVE.

HEARNE CENTER SEAL, Operating One, Two, Three or Four Boxes.

Stroh & Osius Concentrator for Ammoniacal Liquor, used by 50 Gas Companies and Cokeries during the past 4 years.

The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.



LOGAN IRON WORKS,

Brooklyn, N. Y.

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete with Steel Tanks.

BENCHES, SCRUBBERS,

CONDENSERS,

PURIFIERS, IRON ROOFS,

Self-Sealing Retort Lids,

AND ALL PARTS OF

GAS WORKS APPARATUS.

Contractors for Complete Works.

ALSO, SOLE MANUFACTURERS OF

C. W. BLODGET'S

HOT GAS SCRUBBER.

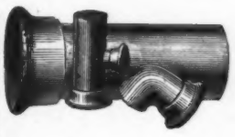
DAVID LEAVITT HOUGH,
Consulting Engineer
AND
CONTRACTOR,
374 FIFTH AVE., N. Y.

GEORGE R. ROWLAND.
Formerly with the Continental Iron Works.
Draughtsman and Constructing Engineer.
Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.
Office, No. 245 Broadway, N. Y. City.

Geo. Shepard Page's Sons.
GAS MACHINERY.
Correspondence Solicited.
69 Wall Street, New York City.

YOU CAN GET A PATENT
For any invention. Send me particulars and a rough sketch for advice, free.
IMPORTANT to have your attorney at Washington, saving time and expense.
HENRY S. THORNBERRY, Patent Solicitor,
1427 F STREET, N. W., WASHINGTON, D. C.

WARREN FOUNDRY AND MACHINE CO.,
Established 1856. Works at Phillipsburgh, N. J.
New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,
FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF
Flange Pipe for Sugar House and Mine Work. Branches. Bends, Retorts, etc., etc

"GLOBE" SPECIALS VALVES, ETC. M. J. DRUMMOND & CO. "GLAMORGAN" FIRE HYDRANTS
MANUFACTURERS OF
CAST IRON
FLANGE
GAS AND WATER PIPE
GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.
Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa
EMAUS PIPE FOUNDRY.
DONALDSON IRON COMPANY. EMAUS, PA

MANUFACTURERS OF
CAST IRON PIPE AND SPECIAL CASTINGS
FOR WATER AND GAS.
Also, FLANGE PIPE, LAMP POSTS, Etc.

CHARLES MILLAR & SON, Selling Agents, Utica, N. Y.
Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.
UTICA PIPE FOUNDRY CO.
Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.
CAST IRON PIPE and SPECIALS FOR WATER AND GAS.
Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

Established 1854.
D. McDONALD & CO.,
MANUFACTURERS OF
WET AND DRY METERS, STATION METERS AND METER PROVERS.
—ALSO MAKERS OF
THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES
OVER 30,000 OF THESE METERS,
ALL OF WHICH ARE GIVING PERFECT SATISFACTION.
Correspondence Solicited.
511 West Twenty-first Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

NATHANIEL TUFTS METER CO.

ESTABLISHED 1849. No. 8 Medford Street, BOSTON, MASS.

Manfrs. of Consumers', Station, Test and Experimental Meters.

Sole New England Agents for the

PERFECT GAS RANGES.

In competitive tests it shows the greatest Efficiency, Durability, and Saving in Repairs.

Made in four grades, with Price and Size to suit any condition. We Guarantee every Range.

SEND FOR A SAMPLE AND MAKE YOUR OWN TESTS.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**
NEW YORK, 1131 and 1133 Broadway. **SAN FRANCISCO, 221 Front St.**

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Perfect" Gas Stoves

THE DIFFERENCE BETWEEN GOOD METERS AND THOSE WHICH ARE "PRETTY GOOD" OFTEN MEANS THOUSANDS OF DOLLARS TO A SINGLE COMPANY.

MANUFACTURE PERFECT GAS METERS

THE KEYSTONE METER CO.

GUARANTEE THEIR WORK TO GIVE SATISFACTION.

Full Line of Sizes Kept Constantly for Sale on the Pacific Coast with
WIESTER & CO., Agents,
17 & 19 New Montgomery St., San Francisco, Cal.

OFFICE AND FACTORY, ROYERSFORD, PA.

American Meter Co.

NEW YORK, PHILADELPHIA,
SAN FRANCISCO.

Prepayment Meters.

Their construction is such that they may be readily readjusted when the scale of gas rates is changed.

HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

METRIC METAL COMPANY,

MAKERS OF

GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

THEODORE D. BUHL, President. CHAS. H. JACOBS, Secretary-Treasurer.

DETROIT METER COMPANY,

DETROIT, MICH.

MAKERS OF...

GAS METERS.

OUR equipment embraces the Latest and Most Improved Machinery. We make our own Tin Plate. We claim for **"BUHL" METERS, Increased Durability,** with probability of **Fewer and Less Expensive Repairs,** and **More Accurate Adjustment.** Comparisons invited. Meters of other Makers promptly Repaired.

MAIL ORDERS SOLICITED.

The Advertisement of

JOHN J. GRIFFIN & CO., Mfrs. of Gas Meters, etc.,

Nos. 1513, 1515, 1517, 1519 & 1521 Race Street, Philadelphia,

52 Dey Street, New York, 75 N. Clinton Street, Chicago,

Occupies this space every alternate week.

In 1898

23 Sets Improved Lowe Water Gas Apparatus
of from 75,000 to 1,500,000 Daily Capacity,
and
2,500,000 Cubic Feet Daily Capacity
Coal Gas Bench Work.

THE

WESTERN GAS CONSTRUCTION COMPANY,

Engineers and Builders,

FORT WAYNE, IND.

Improved Lowe Water Gas Apparatus.
General Gas Works Construction.
Coal Gas Apparatus.
Special Apparatus.
Special Fittings.
Gas Valves.

WILLIAM HENRY WHITE,
EASTERN ENGINEER,
32 Pine St., New York.

GAS VALVES
that can be
TAKEN APART AND CLEANED
WHILE IN USE.

Our Specialty
is the design and arrangement of apparatus to meet special Local Conditions for utilization of the most advantageously procurable materials and convenient operation.